MOSA:C

MODULAR SAFETY INTEGRATED CONTROLLER

(Original instructions)

CE

Dichiarazione CE di conformità

EC declaration of conformity

Torino, 15/06/2010

REER SpA
via Carcano 32
10153 – Torino
Italy

dichiara che il controllore integrato MOSAIC costituisce un dispositivo di sicurezza realizzato in conformità alle seguenti Direttive Europee:

declares that the integrated controller MOSAIC is a safety device complying with the following European Directives:

2006/42/CE	"Direttiva Macchine"
	"Machine Directive"
2004/108/CE	"Direttiva Compatibilità Elettromagnetica"
	"Electromagnetic Compatibility Directive"
2006/95/CE	"Direttiva Bassa Tensione"
	"Low Voltage Directive"

ed è conforme alle seguenti norme:

and complies with the following standards:

CEI EN 61131-2 (07/2007)	Controllori programmabili - Parte 2: Specifiche e prove delle apparecchiature.
	Programmable controllers - Part 2. Equipment requirements and tests.
ISO 13489-1 (06/2008)	Sicurezza del macchinario: Parti dei sistemi di comando legate alla sicurezza. Parte 1: Principi generali per la progettazione.
	Safety of machinery:- Safety-related parts of control systems - Part 1: General principles for design.
EN 61496-1 (11/2005)	Sicurezza del macchinario: Dispositivi Elettrosensibili di protezione, Parte 1: Requisiti generali e tests.
	Safety of machinery : Electro sensitive protective equipment, Part 1: General requirements and tests.
IEC 61508-1 (04/2010)	Sicurezza funzionale di impianti elettrici/elettronici/programmabili legati alla sicurezza: Requisiti generali.
	Functional safety of electrical/electronic programmable electronic safety related systems: General requirements.
IEC 61508-2 (04/2010)	Sicurezza funzionale di impianti elettrici/elettronici/programmabili legati alla sicurezza: Requisiti per impianti elettrici/elettronici/programmabili legati alla sicurezza.
	Functional safety of electrical/electronic/programmable electronic safety related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3 (04/2010)	Sicurezza funzionale di impianti elettrici/elettronici/programmabili legati alla sicurezza: Requisiti Software.
	Functional safety of electrical/electronic programmable electronic safety related systems: Software requirements.
IEC 61784-3 (12/2007)	Reti di comunicazione industriali - Profili - Parte 3: Sicurezza funzionale dei bus di campo - Norme generali e profilo definizioni.
	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
IEC 62061 (01/2005)	Sicurezza del macchinario. Sicurezza funzionale dei sistemi di comando e controllo elettrici, elettronici e programmabili correlati alla sicurezza.
	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems.

raggiungendo il livello di sicurezza pari a: SIL 3 / SILCL 3 / PL e/ Cat. 4 / Tipo 4 (v. standard corrispondenti)

reaching a safety level corresponding to : SIL 3 / SILCL 3 / PL e / Cat. 4 / Type 4 (see related standards)

ed è identico all'esemplare esaminato ed approvato con esame di tipo CE da:

and is identical to the specimen examined and approved with a CE - type approval by:

TÜV SÜD Rail GmbH – Ridlerstrasse 65 – D-80339 – Muenchen – Germany

Carlo Pautasso	**Simone Scaravelli**
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Technical Director	*Managing director*

MODULAR SAFETY INTEGRATED CONTROLLER

CONTENTS

English

English

English

INTRODUCTION

Contents of this handbook

This handbook describes how to use the MOSAIC programmable safety module and its expansion units ("SLAVES");

it includes:

- a description of the system
- method of installation
- connections
- signals
- troubleshooting
- use of the configuration SW

Important safety instructions

> This safety alert symbol indicates a potential **personal safety hazard.** Failure to comply with instructions bearing this symbol could pose a very serious risk to personnel.

> ➔ This symbol indicates an important instruction.

> The MOSAIC is built to the following safety levels: SIL 3, SILCL 3, PL e, Cat. 4, Type 4 in accordance with the applicable standards.
> However, the definitive SIL and PL of the application will depend on the number of safety components, their parameters and the connections that are made, as per the risk analysis.
>
> Read the "Applicable Standards" section carefully.
>
> Perform an in-depth risk analysis to determine the appropriate safety level for your specific application, on the basis of all the applicable standards.
>
> Always test the complete system whenever new safety components are added (see the "TESTING the system" section).
>
> The ambient temperature in the place where the system is installed must be compatible with the operating temperature parameters stated on the product label and in the specifications.
>
> For all matters concerning safety, if necessary, contact your country's competent safety authorities or the competent trade association.

English

Abbreviations and symbols

MCM = MOSAIC Configuration Memory: *memory chip for MOSAIC M1 (accessory)*
MSC = MOSAIC Safety Communication: *proprietary bus for expansion units*
MSD = MOSAIC Safety Designer: *MOSAIC configuration SW running in Windows*
OSSD = Output Signal Switching Device: *solid state safety output*
MTTF = Mean Time to Dangerous Failure
PL = Performance Level
PFH$_d$ = Probability of a dangerous failure per Hour
SIL = Safety Integrity Level
SILCL = Safety Integrity Level Claim Limit
SW = Software

Applicable standards

MOSAIC complies with the following European Directives:
*   **2006/42/EC**   "Machinery Directive"
*   **2004/108/EC**   "Electromagnetic Compatibility Directive"
*   **2006/95/EC**   "Low Voltage Directive"

and is built to the following standards:

CEI EN 61131-2	Programmable controllers, part 2: Equipment requirements and tests
ISO 13489-1	Safety of machinery: Safety related parts of control systems. General principles for design
EN 61496-1	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
IEC 61508-1	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3	Digital data communication for measurement and control: Functional safety fieldbuses.
IEC 62061	Safety of machinery. Functional safety of safety-related electrical, electronic and programmable electronic control systems

Table 1

English

OVERVIEW

MOSAIC is a modular safety controller. It consists of a master unit **(M1)**, which can be configured using the MSD graphic interface, and a number of expansion units connected to the M1 via the proprietary MSC bus.

The M1 can also be used as a stand-alone device. It has 8 safety inputs and 2 independent programmable dual channel outputs.

> ➔ The following expansions are available: I/O expansions **(MI8O2)**, input only expansions **(MI8 and MI16)**, output only expansions **(MO2 and MO4)**, guided contact safety relay output modules **(MR2 and MR4)** and diagnostic connections to the main fieldbuses:
> **MBP** (PROFIBUS), **MBC** (CanOpen)**, MBD** (DeviceNet)**.**

MOSAIC is capable of monitoring the following safety sensors and commands:

optoelectronic sensors (safety light curtains, scanners, safety photocells), mechanical switches, safety mats, emergency stops, two-hand controls, all managed by a single flexible and expandable device.

The system must consist of just one Master M1 and a number of electronic expansions that can range from 0 to a maximum of 7, not more than 4 of which of the same type. There is no limit to the number of relay modules that can be installed.

With 7 expansions, the system can have up to 72 inputs and 8 dual channel safety outputs. The MASTER and its SLAVE units communicate via the 5-way MSC bus (ReeR proprietary bus), physically arranged on the rear panel of each unit.

The MSD software is capable of creating complex logics, using logical operators and safety functions such as muting, timer, counters, etc.

All this is performed through an easy and intuitive graphic interface.

The configuration performed on the PC is sent to the M1 via USB connection; the file resides in the M1 and can also be saved on the proprietary MCM memory chip (accessory). The configuration can therefore quickly be copied to another M1 unit.

> ➔ The MOSAIC system is certified to the maximum safety level envisaged by the applicable industrial safety standards (SIL 3, SILCL 3, PL e, Cat. 4).

English

PRODUCT COMPOSITION

The MOSAIC M1 is supplied with:
- CD-ROM containing the free MSD SW, this PDF multi-language handbook and other product literature.
- Multi-language installation sheet.

➜   NB: the rear panel MSC connector and MCM memory can be ordered separately as accessories.

The expansion units are supplied with:
- Installation sheet.
- Rear panel MSC connector (not present in the MR2 and MR4 which are connected via terminal blocks only).

➜   NB: to install an expansion unit (excluding relays) you will need the MSC connector supplied with the unit plus another MSC for the connection to the M1. This can be ordered separately as an accessory.

English

INSTALLATION

Mechanical fastening

Fix the MOSAIC system units to a 35mm DIN rail as follows:

1. Connect the same number of "MSC" 5-pole rear panel connectors as the number of units to be installed.
2. Fix the train of connectors thus obtained to the DIN rail (hooking them at the top first).
3. Fasten the units to the rail, arranging the contacts on the base of the unit on the respective connector. Press the unit gently until you feel it snap into place.
4. To remove a unit, use a screwdriver to pull down the locking latch on the back of the unit; then lift the unit upwards and pull.
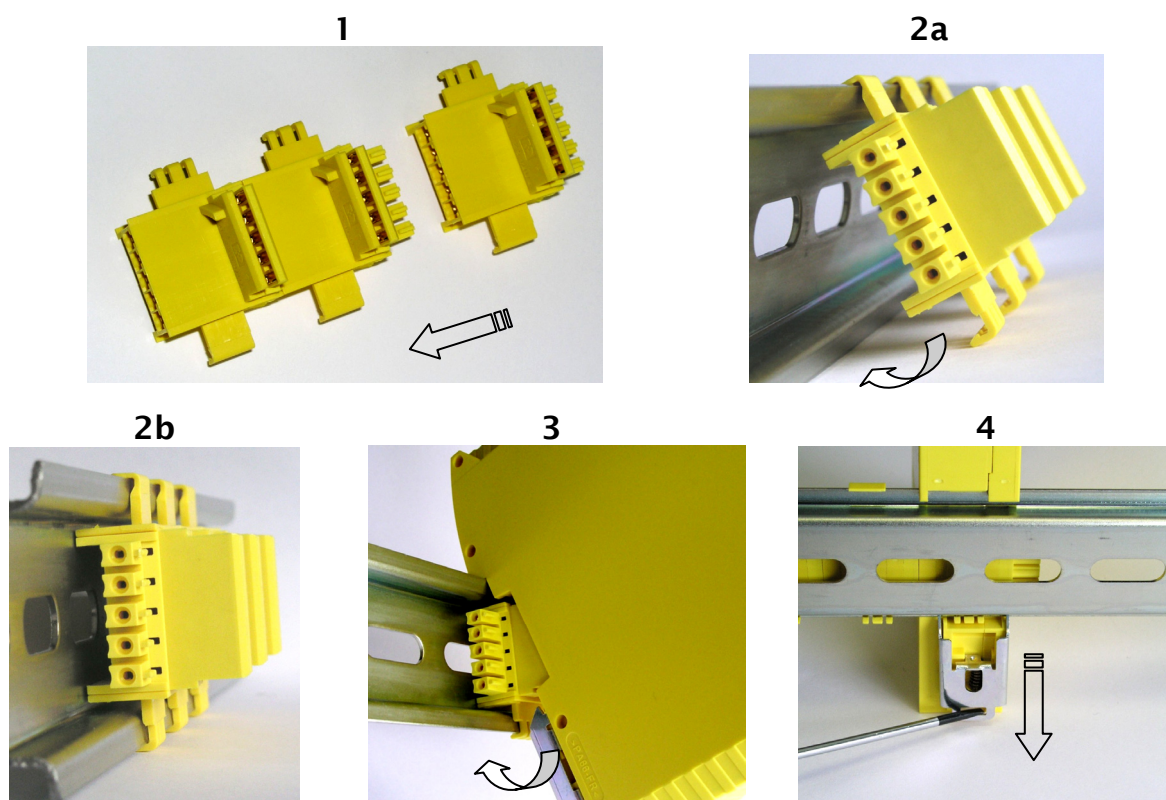
Figure 1

Calculation of safety distance of an ESPE connected to MOSAIC

The ESPE must be positioned at a distance equal to or greater than the minimum safety distance **S** so that the dangerous point can be reached only after stopping the dangerous movement of the machine.

According to the EN999:2008 European standards, the minimum safety distance **S** must be calculated using the following formula :

$$S = K (t1 + t2 + t3) + C$$

$$C = 8 (d-14)$$

where:

S	Minimum safety distance	mm
K	Operator approach speed to the dangerous area	mm/sec
t1	Total response time of the light curtain, in seconds	sec
t2	Response time of the machine in seconds, i.e. the time taken by the machine to stop the dangerous movement from the moment in which the stop signal is transmitted	sec
t3	MOSAIC response time	sec
C	Additional distance that varies according to the application[1]	mm
d	Resolution	mm

Table 2

Electrical connections
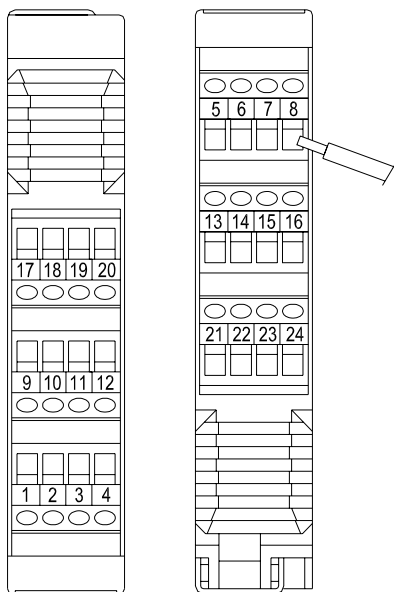
The MOSAIC system units are provided with terminal blocks for the electrical connections. Each unit can have 8, 16 or 24 terminals.
Each unit also has a rear panel plug-in connector (for communication with the master and with the other expansion units).

The MR2 and MR4 are connected via terminal blocks only.

- ⚡ Install safety units in an enclosure with a protection class of at least IP54.
- ⚡ The supply voltage to the units must be 24Vdc ±20% (PELV, in compliance with the standard EN 60204-1 (Chapter 6.4)).
- ⚡ Do not use the MOSAIC to supply external devices.
- ⚡ The same ground connection (0VDC) must be used for all system components.

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[1] For further information on additional safety distance, refer to EN999:2008.

English

Instructions concerning connection cables.

➔ Cables used for connections must be AWG26 ÷ AWG14. Cables used for connections of longer than 50m must have a cross-section of at least 1mm² (AWG16).

➔ We recommend the use of separate power supplies for the safety module and for other electrical power equipment (electric motors, inverters, frequency converters) or other sources of disturbance.

Connections of each single MOSAIC system unit are listed in the table below:

Master M1				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	24VDC	-	24VDC power supply	-
2	MASTER_ENABLE1	Input	Master Enable 1	Input (**"type B"** according to EN 61131-2)
3	MASTER_ENABLE2	Input	Master Enable 2	Input (**"type B"** according to EN 61131-2)
4	GND	-	0VDC power supply	-
5	OSSD1_A	Output	Static output 1	PNP active high
6	OSSD1_B	Output		PNP active high
7	RESTART_FBK1	Input	Feedback/Restart 1	Input according to EN 61131-2
8	OUT_STATUS1	Output	Programmable digital output	PNP active high
9	OSSD2_A	Output	Static output 2	PNP active high
10	OSSD2_B	Output		PNP active high
11	RESTART_FBK2	Input	Feedback/Restart 2	Input according to EN 61131-2
12	OUT_STATUS2	Output	Programmable digital output	PNP active high
13	OUT_TEST1	Output	Short circuit detected output	PNP active high
14	OUT_TEST2	Output	Short circuit detected output	PNP active high
15	OUT_TEST3	Output	Short circuit detected output	PNP active high
16	OUT_TEST4	Output	Short circuit detected output	PNP active high
17	INPUT1	Input	Digital input 1	Input according to EN 61131-2
18	INPUT2	Input	Digital input 2	Input according to EN 61131-2
19	INPUT3	Input	Digital input 3	Input according to EN 61131-2
20	INPUT4	Input	Digital input 4	Input according to EN 61131-2
21	INPUT5	Input	Digital input 5	Input according to EN 61131-2
22	INPUT6	Input	Digital input 6	Input according to EN 61131-2
23	INPUT7	Input	Digital input 7	Input according to EN 61131-2
24	INPUT8	Input	Digital input 8	Input according to EN 61131-2

USB connector

The MOSAIC master M1 includes a USB 2.0 connector (as shown in the figure) for connection to a PC where the **MSD** (MOSAIC Safety Designer) configuration SW resides.

Figure 2 - USB 2.0 front panel connector

TECHNICAL DATA LABEL

MCM LABEL
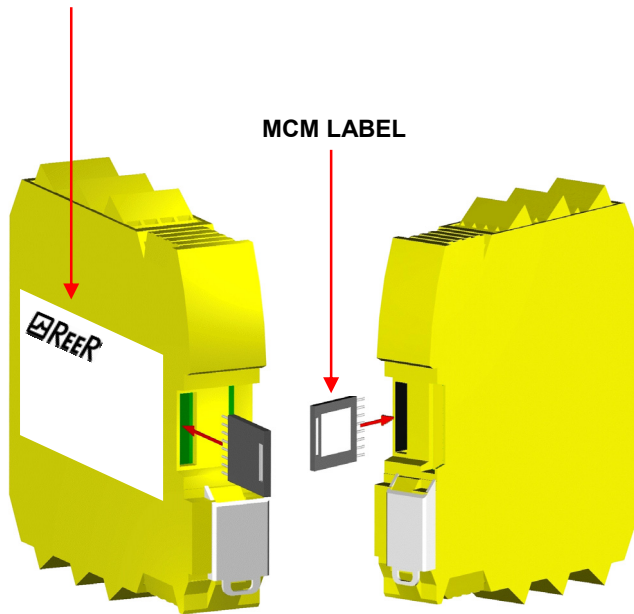
Figure 3 - MCM

MOSAIC Configuration Memory (MCM)

A backup memory, called **MCM** (optional) can be installed in the MOSAIC master M1 and used to save the SW configuration parameters.

The MCM is written **each time** a new project is sent from the PC to the M1.

➔ Always switch the M1 off before logging on to/logging off from the MCM.

Insert the card in the **slot in the rear panel of the M1** (in the direction shown in Figure 3 - MCM)**.**

MULTIPLE LOAD function

Once the configurations have been saved on the MCM, it can be inserted in several M1 units and the USB connection need not be used any more during the configuration.

RESTORE function

If the M1 unit is damaged, you can replace it with a new one; having already saved all the configurations on the MCM, all you need to do is insert the MCM in the new M1, switch on and the system is immediately ready for use.

➔ The LOAD and RESTORE functions can be disabled via SW. (see Figure 24)

➔ In order to be used, the expansion units must be addressed at the time of installation (see the NODE SEL section).

English

⊞*ReeR*

MI8O2				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	**24VDC**	-	24VDC power supply	-
2	**NODE_SEL1**	Input	Node selection	Input (**"type B"** according to EN 61131-2)
3	**NODE_SEL2**	Input		Input (**"type B"** according to EN 61131-2)
4	**GND**	-	0VDC power supply	-
5	**OSSD1_A**	Output	Static output 1	PNP active high
6	**OSSD1_B**	Output		PNP active high
7	**RESTART_FBK1**	Input	Feedback/Restart 1	Input according to EN 61131-2
8	**OUT_STATUS1**	Output	Programmable digital output	PNP active high
9	**OSSD2_A**	Output	Static output 2	PNP active high
10	**OSSD2_B**	Output		PNP active high
11	**RESTART_FBK2**	Input	Feedback/Restart 2	Input according to EN 61131-2
12	**OUT_STATUS2**	Output	Programmable digital output	PNP active high
13	**OUT_TEST1**	Output	Short circuit detected output	PNP active high
14	**OUT_TEST2**	Output	Short circuit detected output	PNP active high
15	**OUT_TEST3**	Output	Short circuit detected output	PNP active high
16	**OUT_TEST4**	Output	Short circuit detected output	PNP active high
17	**INPUT1**	Input	Digital input 1	Input according to EN 61131-2
18	**INPUT2**	Input	Digital input 2	Input according to EN 61131-2
19	**INPUT3**	Input	Digital input 3	Input according to EN 61131-2
20	**INPUT4**	Input	Digital input 4	Input according to EN 61131-2
21	**INPUT5**	Input	Digital input 5	Input according to EN 61131-2
22	**INPUT6**	Input	Digital input 6	Input according to EN 61131-2
23	**INPUT7**	Input	Digital input 7	Input according to EN 61131-2
24	**INPUT8**	Input	Digital input 8	Input according to EN 61131-2

Table 3

MI16				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	**24VDC**	-	24VDC power supply	-
2	**NODE_SEL1**	Input	Node selection	Input (**"type B"** according to EN 61131-2)
3	**NODE_SEL2**	Input		Input (**"type B"** according to EN 61131-2)
4	**GND**	-	0VDC power supply	-
5	**INPUT1**	Input	Digital input 1	Input according to EN 61131-2
6	**INPUT2**	Input	Digital input 2	Input according to EN 61131-2
7	**INPUT3**	Input	Digital input 3	Input according to EN 61131-2
8	**INPUT4**	Input	Digital input 4	Input according to EN 61131-2
9	**OUT_TEST1**	Output	Short circuit detected output	PNP active high
10	**OUT_TEST2**	Output	Short circuit detected output	PNP active high
11	**OUT_TEST3**	Output	Short circuit detected output	PNP active high
12	**OUT_TEST4**	Output	Short circuit detected output	PNP active high
13	**INPUT5**	Input	Digital input 5	Input according to EN 61131-2
14	**INPUT6**	Input	Digital input 6	Input according to EN 61131-2
15	**INPUT7**	Input	Digital input 7	Input according to EN 61131-2
16	**INPUT8**	Input	Digital input 8	Input according to EN 61131-2
17	**INPUT9**	Input	Digital input 9	Input according to EN 61131-2
18	**INPUT10**	Input	Digital input 10	Input according to EN 61131-2
19	**INPUT11**	Input	Digital input 11	Input according to EN 61131-2
20	**INPUT12**	Input	Digital input 12	Input according to EN 61131-2
21	**INPUT13**	Input	Digital input 13	Input according to EN 61131-2
22	**INPUT14**	Input	Digital input 14	Input according to EN 61131-2
23	**INPUT15**	Input	Digital input 15	Input according to EN 61131-2
24	**INPUT16**	Input	Digital input 16	Input according to EN 61131-2

Table 4

English

MI8				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	**24VDC**	-	24VDC power supply	-
2	**NODE_SEL1**	Input	Node selection	Input (**"type B"** according to EN 61131-2)
3	**NODE_SEL2**	Input		Input (**"type B"** according to EN 61131-2)
4	**GND**	-	0VDC power supply	-
5	**INPUT1**	Input	Digital input 1	Input according to EN 61131-2
6	**INPUT2**	Input	Digital input 2	Input according to EN 61131-2
7	**INPUT3**	Input	Digital input 3	Input according to EN 61131-2
8	**INPUT4**	Input	Digital input 4	Input according to EN 61131-2
9	**OUT_TEST1**	Output	Short circuit detected output	PNP active high
10	**OUT_TEST2**	Output	Short circuit detected output	PNP active high
11	**OUT_TEST3**	Output	Short circuit detected output	PNP active high
12	**OUT_TEST4**	Output	Short circuit detected output	PNP active high
13	**INPUT5**	Input	Digital input 5	Input according to EN 61131-2
14	**INPUT6**	Input	Digital input 6	Input according to EN 61131-2
15	**INPUT7**	Input	Digital input 7	Input according to EN 61131-2
16	**INPUT8**	Input	Digital input 8	Input according to EN 61131-2

Table 5

MO4				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	**24VDC**	-	24VDC power supply	-
2	**NODE_SEL1**	Input	Node selection	Input (**"type B"** according to EN 61131-2)
3	**NODE_SEL2**	Input		Input (**"type B"** according to EN 61131-2)
4	**GND**	-	0VDC power supply	-
5	**OSSD1_A**	Output	Static output 1	PNP active high
6	**OSSD1_B**	Output		PNP active high
7	**RESTART_FBK1**	Input	Feedback/Restart 1	Input according to EN 61131-2
8	**OUT_STATUS1**	Output	Programmable digital output	PNP active high
9	**OSSD2_A**	Output	Static output 2	PNP active high
10	**OSSD2_B**	Output		PNP active high
11	**RESTART_FBK2**	Input	Feedback/Restart 2	Input according to EN 61131-2
12	**OUT_STATUS2**	Output	Programmable digital output	PNP active high
13	**24VDC**	-	24VDC power supply	OSSD1/2 power supply
14	**24VDC**	-	24VDC power supply	OSSD3/4 power supply
15	**GND**	-	0VDC power supply	-
16	**GND**	-	0VDC power supply	-
17	**OSSD4_A**	Output	Static output 4	PNP active high
18	**OSSD4_B**	Output		PNP active high
19	**RESTART_FBK4**	Input	Feedback/Restart 4	Input according to EN 61131-2
20	**OUT_STATUS4**	Output	Programmable digital output	PNP active high
21	**OSSD3_A**	Output	Static output 3	PNP active high
22	**OSSD3_B**	Output		PNP active high
23	**RESTART_FBK3**	Input	Feedback/Restart 3	Input according to EN 61131-2
24	**OUT_STATUS3**	Output	Programmable digital output	PNP active high

Table 6

English

MO2				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	**24VDC**	-	24VDC power supply	-
2	**NODE_SEL1**	Input	Node selection	Input (*"type B"* according to EN 61131-2)
3	**NODE_SEL2**	Input		Input (*"type B"* according to EN 61131-2)
4	**GND**	-	0VDC power supply	-
5	**OSSD1_A**	Output	Static output 1	PNP active high
6	**OSSD1_B**	Output		PNP active high
7	**RESTART_FBK1**	Input	Feedback/Restart 1	Input according to EN 61131-2
8	**OUT_STATUS1**	Output	Condition of outputs 1A/1B	PNP active high
9	**OSSD2_A**	Output	Static output 2	PNP active high
10	**OSSD2_B**	Output		PNP active high
11	**RESTART_FBK2**	Input	Feedback/Restart 2	Input according to EN 61131-2
12	**OUT_STATUS2**	Output	Condition of outputs 2A/2B	PNP active high
13	**24VDC**	-	24VDC power supply	OSSD1/2 power supply
14	**n.c.**	-	-	-
15	**GND**	-	0VDC power supply	-
16	**n.c.**	-	-	-

Table 7

MR4				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	**24VDC**	-	24VDC power supply	-
4	**GND**	-	0VDC power supply	-
5	**OSSD1_A**	Input	Control **ZONE 1**	PNP active high
6	**OSSD1_B**	Input		
7	**FBK_K1_K2_1**	Output	Feedback K1K2 **ZONE 1**	N.C.
9	**A_NC1**	Output	NC contact **ZONE 1**	
10	**B_NC1**	Output		
13	**A_NO11**	Output	NO1 contact **ZONE 1**	
14	**B_NO11**	Output		
15	**A_NO12**	Output	NO2 contact **ZONE 1**	
16	**B_NO12**	Output		
11	**A_NC2**	Output	NC contact **ZONE 2**	
12	**B_NC2**	Output		
17	**OSSD2_A**	Input	Control **ZONE 2**	PNP active high
18	**OSSD2_B**	Input		
19	**FBK_K1_K2_2**	Output	Feedback K1K2 **ZONE 2**	N.C.
21	**A_NO21**	Output	NO1 contact **ZONE 2**	
22	**B_NO21**	Output		
23	**A_NO22**	Output	NO2 contact **ZONE 2**	
24	**B_NO22**	Output		

Table 8

English

MR2				
TERMINAL	**SIGNAL**	**TYPE**	**DESCRIPTION**	**OPERATION**
1	24VDC	-	24VDC power supply	-
4	GND	-	0VDC power supply	-
5	OSSD1_A	Input	Control **ZONE 1**	PNP active high
6	OSSD1_B	Input		
7	FBK_K1_K2_1	Output	Feedback K1K2 **ZONE 1**	N.C.
9	A_NC1	Output	NC contact **ZONE 1**	
10	B_NC1	Output		
13	A_NO11	Output	NO1 contact **ZONE** 1	
14	B_NO11	Output		
15	A_NO12	Output	NO2 contact **ZONE 1**	
16	B_NO12	Output		

Table 9

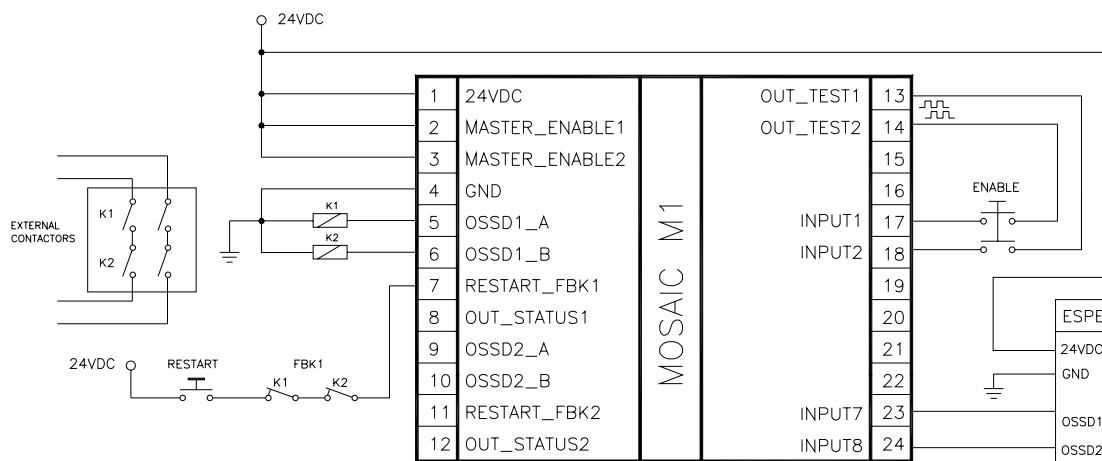## EXAMPLE OF CONNECTION OF MOSAIC TO THE MACHINE CONTROL SYSTEM
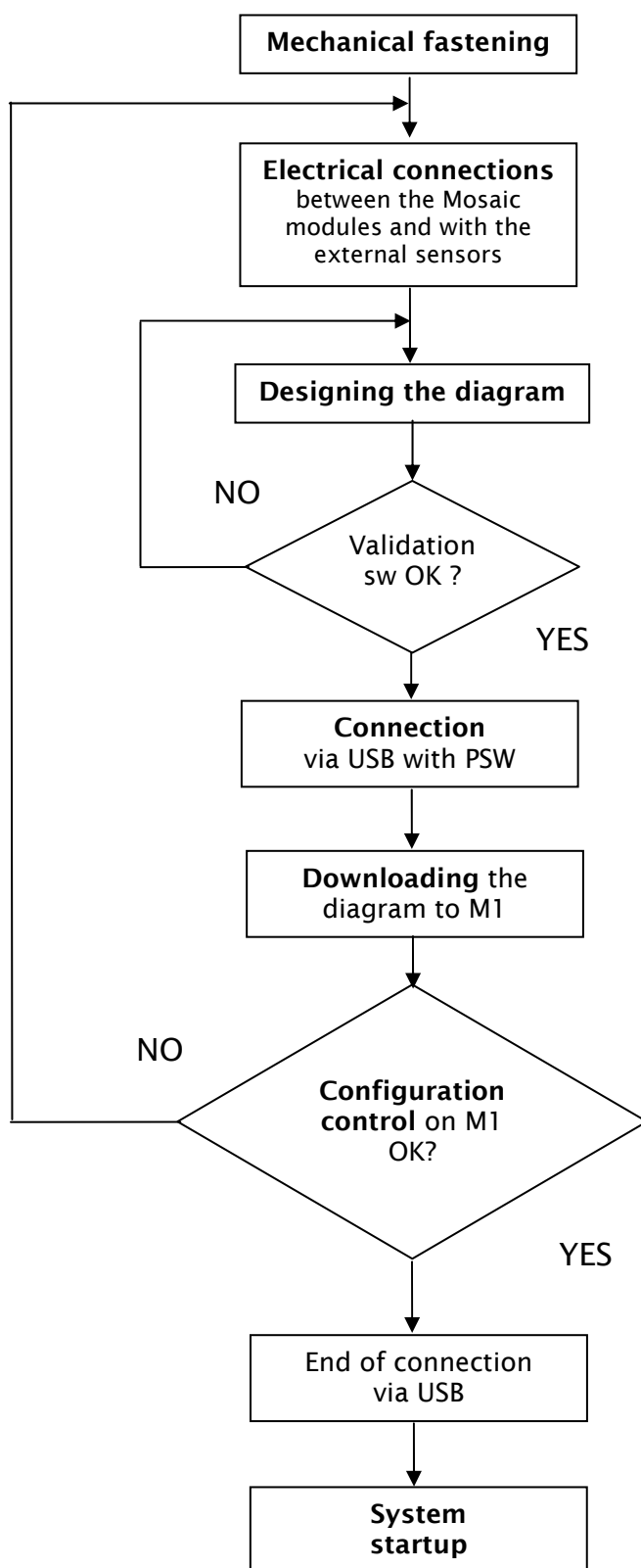

Figure 4

CHECKLIST AFTER INSTALLATION

The MOSAIC system is able to detect the faults that occurs in each own module.
Anyway to have the system perfect operation perform the following checks at least every 1 year:

1. *Operate a complete system TEST (see "TESTING the system")*
2. *Verify that all the cables are correctly screwed to the terminal blocks.*
3. *Verify that all the leds (indicators) light on correctly.*
4. *Verify the positioning of all the sensors connected to MOSAIC.*
5. *Verify the correct fixing of MOSAIC to the DIN rail.*
6. *Verify that all the external indicators (lamps) work properly.*

➔ After installation (or maintenance) perform a System TEST as described in the paragraph *"TESTING the system"*

English

OPERATING DIAGRAM

```
                    ┌─────────────────────┐
                    │ Mechanical fastening│
                    └─────────────────────┘
                               │
                               ▼
                    ┌─────────────────────┐
                    │Electrical connections│
                    │  between the Mosaic  │
                    │  modules and with the│
                    │   external sensors   │
                    └─────────────────────┘
                               │
                               ▼
                    ┌─────────────────────┐
                    │ Designing the diagram│
                    └─────────────────────┘
                               │
                               ▼
              NO            ◇ Validation ◇
                              sw OK ?
                                        YES
                               │
                               ▼
                    ┌─────────────────────┐
                    │     Connection       │
                    │   via USB with PSW   │
                    └─────────────────────┘
                               │
                               ▼
                    ┌─────────────────────┐
                    │  Downloading the     │
                    │   diagram to M1      │
                    └─────────────────────┘
                               │
                               ▼
              NO            ◇ Configuration ◇
                              control on M1
                                  OK?
                                        YES
                               │
                               ▼
                    ┌─────────────────────┐
                    │  End of connection   │
                    │      via USB         │
                    └─────────────────────┘
                               │
                               ▼
                    ┌─────────────────────┐
                    │      System          │
                    │      startup         │
                    └─────────────────────┘
```

English

SIGNALS

INPUTS

MASTER ENABLE

The MOSAIC M1 master has two inputs: MASTER_ENABLE1 and MASTER_ENABLE2.

➔ These signals must <u>both be permanently set</u> to logic level 1 (24VDC) for the MOSAIC to operate. To disable the MOSAIC simply lower these inputs to logic level 0 (0VDC).

NODE SEL

The NODE_SEL1 and NODE_SEL2 inputs (on the SLAVE units) are used to attribute a physical address to the slave units (up to 4 units of the same type can be used) by connecting these as shown in Table 10:

	NODE_SEL1	NODE_SEL2
SLAVE 0	**0 (or not connected)**	**0 (or not connected)**
SLAVE 1	**0 (or not connected)**	**24VDC**
SLAVE 2	**24VDC**	**0 (or not connected)**
SLAVE 3	**24VDC**	**24VDC**

Table 10

➔ The same physical address cannot be assigned to two units of the same type.

English

RESTART_FBK

The RESTART_FBK signal input allows the MOSAIC to verify an EDM (External Device Monitoring) feedback signal from the external contactors, and to monitor Manual/Automatic operation (See the list of possible connections in Table 11).

Each OSSD pairs has a RESTART_FBK corresponding input.

> ⚠ The RESTART command must be installed outside the danger area in a position where the danger area and the entire work area concerned are clearly visible.
> ⚠ It must not be possible to reach the control from inside the danger area.
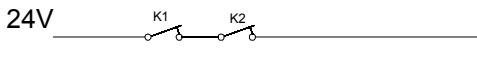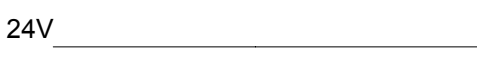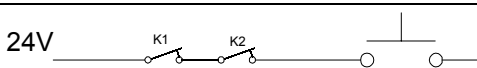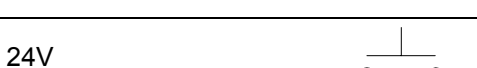
MODE OF OPERATION	EDM	RESTART_FBK
AUTOMATIC	With K1_K2 control	24V ——K1——K2—— ext_Restart_fbk
	Without K1_K2 control	24V —————————— ext_Restart_fbk
MANUAL	With K1_K2 control	24V ——K1——K2——○—○— ext_Restart_fbk
	Without K1_K2 control	24V —————○—○— ext_Restart_fbk

Table 11

OUTPUTS

OUT STATUS

The OUT STATUS signal is a programmable digital output that can indicate the status of:
- An input.
- An output.
- A node of the logic diagram designed using the MSD.

OUT TEST

The OUT TEST signals must be used to monitor the presence of short-circuits or overloads on the inputs (Figure 5).

SHORT CIRCUIT CONTROL

17	INPUT1
18	INPUT2
19	INPUT3
20	INPUT4
14	OUT TEST2
13	OUT TEST1
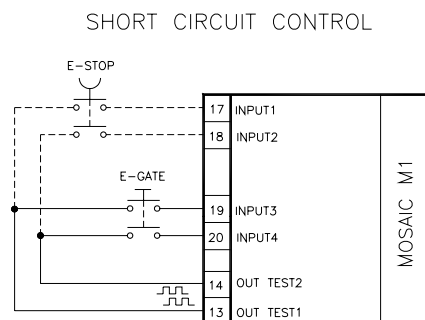
Figure 5

OSSD (M1, MI8O2)

The OSSD *(static semiconductor safety outputs)* are short circuit protected, cross circuit monitored and supply:
- In the ON condition: **Uv-0,75V ÷ Uv** *(where Uv is 24V ± 20%)*
- In the OFF condition: **0V ÷ 2V r.m.s.**

The maximum load of 400mA@24V corresponds to a minimum resistive load of 60Ω.

The maximum capacitive load is 0.82μF. The maximum inductive load is 30mH.

OSSD (MO2, MO4)

The OSSD *(static semiconductor safety outputs)* are short circuit protected, cross circuit monitored and supply:
- In the ON condition: **Uv-0,75V ÷ Uv** *(where Uv is 24V ± 20%)*
- In the OFF condition: **0V ÷ 2V r.m.s.**

The maximum load of 400mA@24V corresponds to a minimum resistive load of 60Ω.

The maximum capacitive load is 0.82μF. The maximum inductive load is 30mH.

➜ It is not allowed to connect external hardware to the outputs, when it is not used in the MDS program.

Each OSSD output can be configured as shown in Table 12:

Automatic	The output is activated according to le configurations set by the MSD SW only if the corresponding RESTART_FBK input is conected to 24VDC.
Manual	The output is activated according to le configurations set by the MSD SW only if corresponding RESTART_FBK input FOLLOWS A LOGIC TRANSITION OF **0-->1.**
Monitored	The output is activated according to le configurations set by the MSD SW only if the corresponding RESTART_FBK input FOLLOWS A LOGIC TRANSITION OF **0-->1-->0.**

Table 12

English

SAFETY RELAYS (MR2, MR4)

Characteristics of the output circuit.

The MR2/MR4 units use guided contact safety relays, each of which provides **two N.O. contacts and one N.C contact in addition to the N.C. feedback contact**.
The MR2 unit uses two safety relays and the MR4 uses four.

Excitation voltage	**17...31 VDC**
Minimum switchable voltage	**10 VDC**
Minimum switchable current	**20 mA**
Maximum switchable voltage (DC)	**250VDC**
Maximum switchable voltage (AC)	**400VAC**
Maximum switchable current	**6A**
Response time	**12ms**
Mechanical life of contacts	**> 20 x 10^6**

Table 13

➜ To guarantee correct isolation and avoid the risk of premature ageing of or damage to the relays, each output line must be protected using a delay 3.5A fuse and the load characteristics must be consistent with those specified in Table 12.

➜ See the "MR2 - MR4" section (for further details on these relays).

Switching operation timing diagram.

Figure 6

English
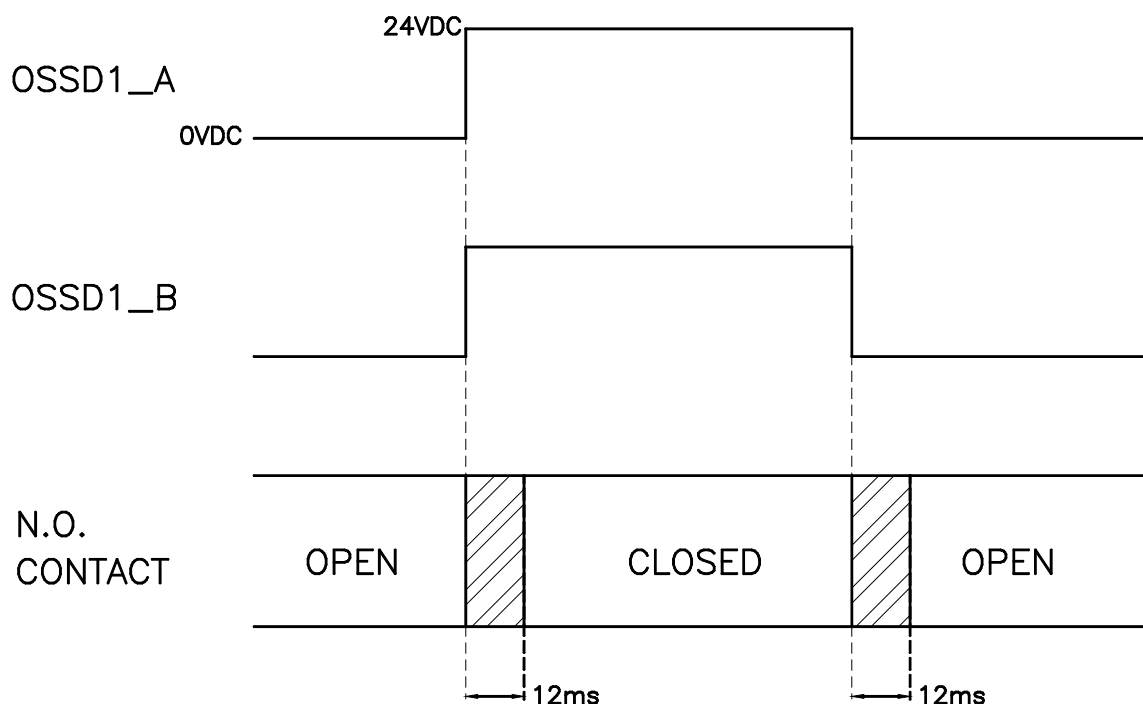
TECHNICAL FEATURES

GENERAL SYSTEM CHARACTERISTICS

Safety level

Parameter	Value	Standard
PFH_d	$10^{-8} \div 10^{-7}$	**IEC 61508:1998**
SIL	3	
SILCL	3	**IEC 62061:2005**
PL	e	**ISO 13849-1 : 2006**
DC_{avg}	High	
MTTFd (years)	$30 \div 100$	
Category	4	
Type	4	**EN 61496-1**

General data

Device lifetime	20 years
Max number of inputs	72
Max number of outputs	8
Max number of slave units (excluding MR2-MR4)	7
Max number of slave units of the same type (excluding MR2-MR4)	4
Rated voltage	$24VDC \pm 20\%$
Digital INPUTS	PNP active high (EN 61131-2)
OSSD (M1, MI8O2, MO2, MO4)	PNP active high - 400mA@24VDC max
Digital OUTPUTS	PNP active high - 100mA@24VDC max

Response time	Master	10 ms	$+ T_{Input\_filter}$
	M1 + 1 Slave	19.5 ms	$+ T_{Input\_filter}$
	M1 + 2 Slaves	22 ms	$+ T_{Input\_filter}$
	M1 + 3 Slaves	24 ms	$+ T_{Input\_filter}$
	M1 + 4 Slaves	26 ms	$+ T_{Input\_filter}$
	M1 + 5 Slaves	28 ms	$+ T_{Input\_filter}$
	M1 + 6 Slaves	30.5 ms	$+ T_{Input\_filter}$
	M1 + 7 Slaves	32.5 ms	$+ T_{Input\_filter}$

M1> module connection	ReeR proprietary 5-pole bus (MSC)
Connection cable cross-section	$0.5 \div 2.5$ mm²
Max length of connections	100m
Operating temperature	$-10 \div 55°C$
Storage temperature	$-20 \div 70°C$
Relative humidity	$10\% \div 95\%$

➜ T_{Input_filter} = max filtering time from among those set on project inputs (see "INPUTS" section").

English

Enclosure

Description	Electronic housing max 24 pole, with locking latch mounting
Enclosure material	Polyamide
Enclosure protection class	IP 20
Terminal blocks protection class	IP 2X
Fastening	Quick coupling to rail according to EN 60715
Dimensions (h x l x d)	108 x 22.5 x 114.5

M1

Rated voltage	24VDC ± 20%
Dissipated power	3W max
Unit enable (No./description)	2 / PNP active high "*type B*" according to EN 61131-2
Digital INPUTS (No./description)	8 / PNP active high according to EN 61131-2
INPUT FBK/RESTART (No./description)	2 / EDM control / possible Automatic or Manual operation with RESTART button
Test OUTPUT (No./description)	4 / to check for short-circuits - overloads
Digital OUTPUTS (No./description)	2 / programmable - PNP active high
OSSD (No./description)	2 pairs / solid state safety outputs PNP active high 400mA@24VDC max
SLOT for MCM card	Proprietary connection available
Connection to PC	USB 2.0 (Hi Speed) - Max cable length: 3m
Connection to slave units	via MSC 5-way ReeR proprietary bus

MI8O2

Rated voltage	24VDC ± 20%
Dissipated power	3W max
Digital INPUTS (No./description)	**8** / PNP active high according to EN 61131-2
Test OUTPUT (No./description)	**8** / to check for short-circuits - overloads
Digital OUTPUTS (No./description)	**2** / programmable - PNP active high
OSSD (No./description)	**2** pairs / solid state safety outputs: PNP active high – 400mA@24VDC max
Connection to M1	via **MSC** 5-way ReeR proprietary bus

English

MI8 - MI16

Model	MI8	MI16
Rated voltage	24VDC ± 20%	
Dissipated power	3W max	
Digital INPUTS (No./description)	8	16
	PNP active high according to EN 61131-2	
Test OUTPUT (No./description)	**4** / to check for short-circuits - overloads	
Connection to M1	via **MSC** 5-way ReeR proprietary bus	

MO2 - MO4

Model	MO2	MO4
Rated voltage	24VDC ± 20%	
Dissipated power	3W max	
Digital OUTPUTS (No./description)	**2**	4
	programmable - PNP active high	
OSSD (No./description)	**2**	4
	Solid state safety outputs: PNP active high 400mA@24VDC max	
Connection to M1	via **MSC** 5-way ReeR proprietary bus	

MR2 - MR4

Model	MR2	MR4
Rated voltage	24VDC ± 20%	
Dissipated power	3W max	
Switching voltage	240 VAC	
Switching current	6A max	
N.O. contacts	2 N.A. + 1 N.C.	4 N.A. + 2 N.C.
FEEDBACK contacts	1	2
Response time	12ms	
Mechanical life of contacts	> 20 x 10^6	
Connection to output module	Via front-panel terminal strip **(no connection via MSC bus)**	

English

MECHANICAL DIMENSIONS

99 mm

22.5 mm

114.5 mm

108 mm
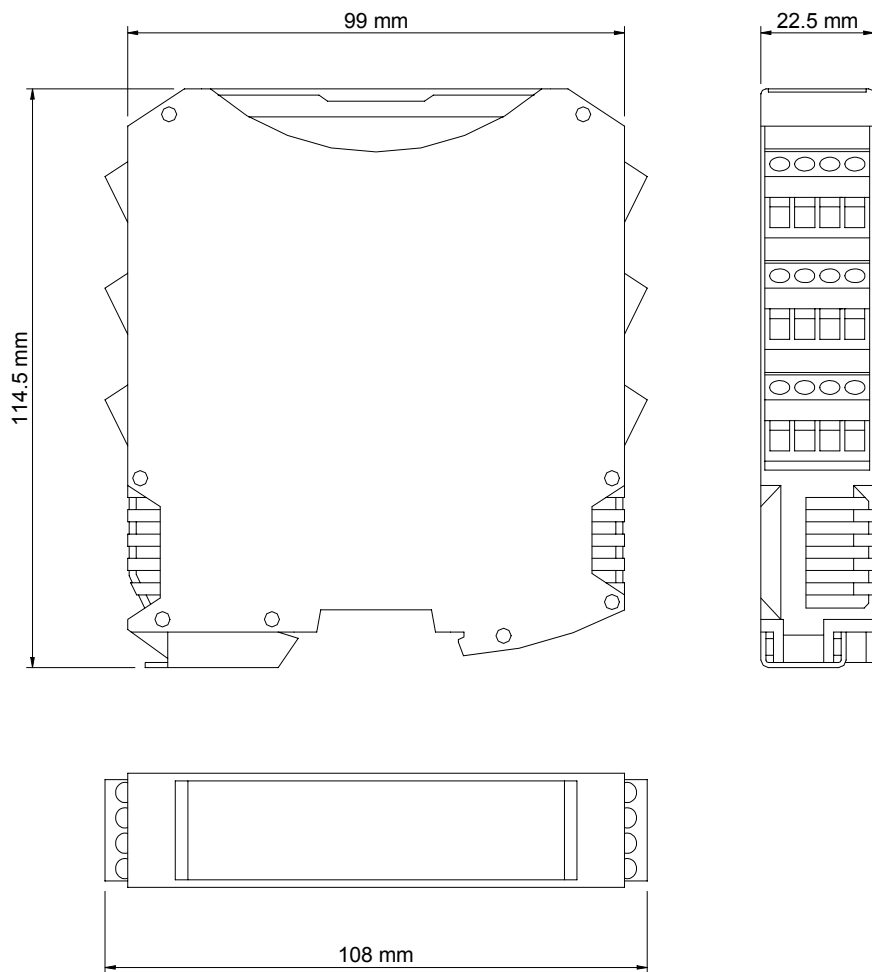
Figure 7

SIGNALS

Master M1 (Figure 8)

◢◣ReeR

ON RUN

IN EXT
FAIL

COM ENA

M1

1 2
IN
3 4

5 6

7 8

1 2
OSSD
1 2
CLEAR
1 2
STATUS

MOSAIC
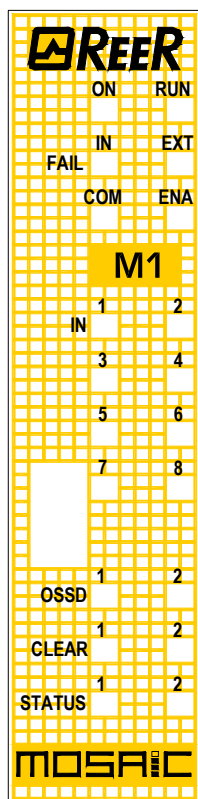
Figure 8 - M1

MEANING	LED								
	RUN GREEN	IN FAIL RED	EXT FAIL RED	COM ORANGE	ENA BLUE	IN1÷8 YELLOW	OSDD1/2 RED/GREEN	CLEAR1/2 YELLOW	STATUS1/2 YELLOW
Power on - initial TEST	ON	ON	ON	ON	ON	ON	Red	ON	ON
MCM recognised	OFF	OFF	OFF	ON (max 1s)	ON (max 1s)	OFF	Red	OFF	OFF
Loading diagram from MCM card	OFF	OFF	OFF	5 flashes	5 flashes	OFF	Red	OFF	OFF
MSD requesting connection: internal configuration not valid	OFF	OFF	OFF	Flashes slowly	OFF	OFF	Red	OFF	OFF
MSD requesting connection: MCM configuration not valid	OFF	OFF	OFF	Flashes quickly	OFF	OFF	Red	OFF	OFF
MSD connected M1 stopped	OFF	OFF	OFF	ON	OFF	OFF	Red	OFF	OFF

Table 14 - Opening Screen

MEANING	LED								
	RUN GREEN	IN FAIL RED	EXT FAIL RED	COM ORANGE	IN1÷8 YELLOW	ENA BLUE	OSSD1/2 RED/GREEN	CLEAR1/2 YELLOW	STATUS1/2 YELLOW
NORMAL OPERATION	ON	OFF	OFF op. OK	ON = M1 connected to PC OFF=otherwise	INPUT condition	ON MASTER_ENABLE1 and MASTER_ENABLE2 active OFF otherwise	RED with output OFF GREEN with output ON	ON waiting for RESTART Flashing NO feedback	OUTPUT condition
EXTERNAL FAULT DETECTED	ON	OFF	ON incorrect external connection detected	ON = M1 connected to PC OFF=otherwise	only the number of the INPUT with the incorrect connection **flashes**				

Table 15 - Dynamic Screen

English

MI8O2 (Figure 9)
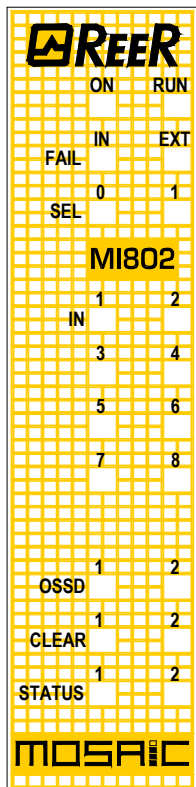
MEANING	LED							
	RUN **GREEN**	**IN FAIL** **RED**	**EXT FAIL** **RED**	**SEL** **ORANGE**	**IN1÷8** **YELLOW**	**OSSD1/2** **RED/GREEN**	**CLEAR1/2** **YELLOW**	**STATUS1/2** **YELLOW**
Power on - initial TEST	ON	ON	ON	ON	ON	Red	ON	ON

Table 16 - Opening Screen

MEANING	LED							
	RUN **GREEN**	**IN FAIL** **RED**	**EXT FAIL** **RED**	**IN1÷8** **YELLOW**	**SEL** **ORANGE**	**OSSD1/2** **RED/GREEN**	**CLEAR1/2** **YELLOW**	**STATUS1/2** **YELLOW**
NORMAL OPERATION	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	OFF	**OFF** **ON** incorrect external connection detected	INPUT condition only the number of the INPUT with the incorrect connection **flashes**	Shows the NODE_SEL1/2 signal table	**RED** with output OFF **GREEN** with output ON	**ON** waiting for RESTART **Flashes** NO feedback	OUTPUT condition

Table 17 - Dynamic Screen

Figure 9 - MI8O2

MI8 (Figure 10)

Figure 10 - MI8
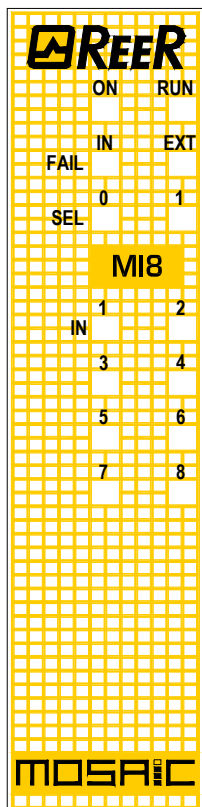
MEANING	LED				
	RUN GREEN	IN FAIL RED	EXT FAIL RED	SEL ORANGE	IN1÷8 YELLOW
Power on - initial TEST	ON	ON	ON	ON	ON

Table 18 - Opening Screen

MEANING	LED				
	RUN GREEN	IN FAIL RED	EXT FAIL RED	SEL ORANGE	IN1÷8 YELLOW
NORMAL OPERATION	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	OFF	OFF **ON** incorrect external connection detected	Shows the NODE_SEL1/2 signal table	INPUT condition only the number of the INPUT with the incorrect connection **flashes**

Table 19 - Dynamic Screen
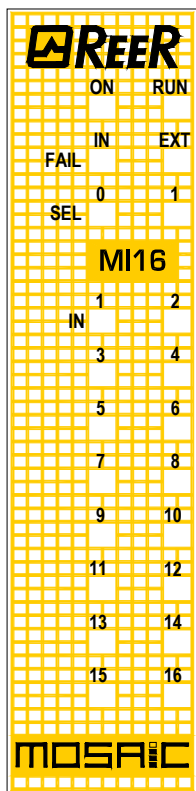
English

MI16 (Figure 11)

Figure 11 - MI16

MEANING	LED				
	RUN	**IN FAIL**	**EXT FAIL**	**SEL**	**IN1÷16**
	GREEN	**RED**	**RED**	**ORANGE**	**YELLOW**
Power on - initial TEST	ON	ON	ON	ON	ON

Table 20 - Opening Screen

MEANING	LED				
	RUN	**IN FAIL**	**EXT FAIL**	**SEL**	**IN1÷16**
	GREEN	**RED**	**RED**	**ORANGE**	**YELLOW**
NORMAL OPERATION	**OFF** if the unit is waiting for the first communication from the MASTER / **FLASHES** if no INPUT or OUTPUT requested by the configuration / **ON** if INPUT or OUTPUT requested by the configuration	**OFF**	**OFF** / **ON** incorrect external connection detected	Shows the NODE_SEL1/2 signal table	INPUT condition / only the number of the INPUT with the incorrect connection **flashes**

Table 21 - Dynamic Screen
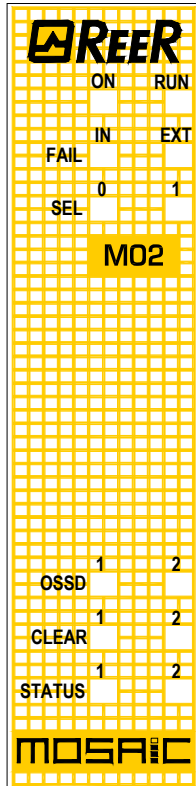
MO2 (Figure 12)

Figure 12 - MO2

MEANING	LED						
	RUN GREEN	IN FAIL RED	EXT FAIL RED	SEL ORANGE	OSDD1/2 RED/GREEN	CLEAR1/2 YELLOW	STATUS1/2 YELLOW
Power on - initial TEST	ON	ON	ON	ON	Red	ON	ON

Table 22 - Opening screen

MEANING	LED						
	RUN GREEN	IN FAIL RED	EXT FAIL RED	SEL ORANGE	OSSD1/2 RED/GREEN	CLEAR1/2 YELLOW	STATUS1/2 YELLOW
NORMAL OPERATION	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF** op. OK	**OFF** op. OK	Shows the NODE_SEL1/2 signal table	**RED** with output OFF **GREEN** with output ON	**ON** waiting for RESTART **Flashes** NO feedback	OUTPUT condition

Table 23 - Dynamic screen

MO4 (Figure 13)
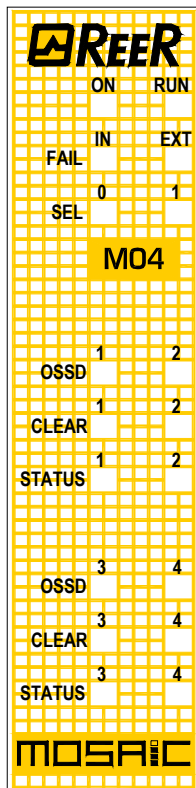
Figure 13 - MO4

MEANING	LED						
	RUN GREEN	IN FAIL RED	EXT FAIL RED	SEL ORANGE	OSDD1/4 RED/GREEN	CLEAR1/4 YELLOW	STATUS1/4 YELLOW
Power on - initial TEST	ON	ON	ON	ON	Red	ON	ON

Table 24 - Opening screen

MEANING	LED						
	RUN GREEN	IN FAIL RED	EXT FAIL RED	SEL ORANGE	OSDD1/4 RED/GREEN	CLEAR1/4 YELLOW	STATUS1/4 YELLOW
NORMAL OPERATION	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF** op. OK	**OFF** op. OK	Shows the NODE_SEL1/2 signal table	**RED** with output OFF **GREEN** with output ON	**ON** waiting for RESTART **Flashes** NO feedback	OUTPUT condition

Table 25 - Dynamic screen

MR2 (Figure 14) / MR4 (Figure 15)
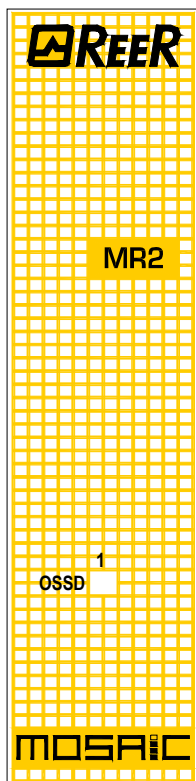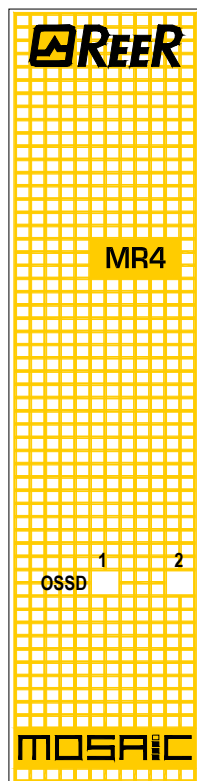
Figure 14 - MR2   Figure 15 - MR4

MEANING	LED
	OSSD1
	RED/GREEN
Power on - initial TEST	Red

Table 26 - MR2 - Opening screen

MEANING	LED
	OSSD1
	RED/GREEN
NORMAL OPERATION	**RED** With output OFF - **GREEN** with output ON

Table 27 - MR2 - Dynamic screen

MEANING	LED	
	OSSD1	OSSD2
	RED/GREEN	RED/GREEN
Power on - initial TEST	Red	Red

Table 28 - MR4 - Opening screen

MEANING	LED	
	OSSD1	OSSD2
	RED/GREEN	RED/GREEN
NORMAL OPERATION	**RED** with output OFF - **GREEN** with output ON	

Table 29 - MR4 - Dynamic screen

TROUBLESHOOTING

Master M1 (Figure 16)
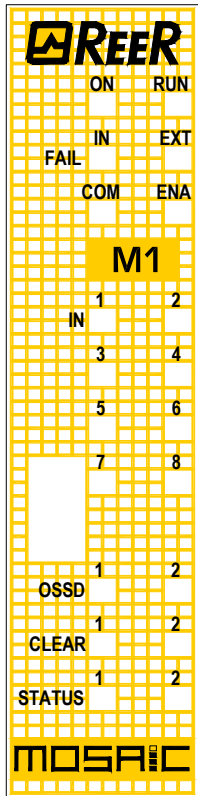
Figure 16 - M1

MEANING	LED									REMEDY
	RUN GREEN	IN FAIL RED	EXT FAIL RED	COM ORANGE	IN1÷8 YELLOW	ENA BLUE	OSSD1/2 RED/GREEN	CLEAR1/2 YELLOW	STATUS1/2 YELLOW	
Internal fault	OFF	2 or 3 flashes	OFF	OFF	OFF	OFF	Red	OFF	OFF	Return the unit to ReeR to be repaired
Configuration error	OFF	5 flashes	OFF	OFF	5 flashes	OFF	5 flashes	5 flashes	5 flashes	• Upload the project to the MOSAIC again. • If the problem persists return the M1 to ReeR to be repaired
OSSD output error	OFF	4 flashes	OFF	OFF	OFF	OFF	4 flashes (only the LED corresponding to the output in FAIL mode)	OFF	OFF	• Check the OSSD1/2 connections • If the problem persists return the M1 to ReeR to be repaired
Error in communication with slave	OFF	5 flashes	OFF	OFF	OFF	OFF	OFF	OFF	OFF	• Restart the system. • If the problem persists return the M1 to ReeR to be repaired
Slave unit error	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	• Restart the system • Check which unit is in FAIL mode
MCM error	OFF	6 flashes	OFF	6 flashes	OFF	OFF	OFF	OFF	OFF	Replace the MCM

Table 30 - Troubleshooting M1

MI8O2 (Figure 17)

Figure 17 - MI8O2

MEANING	LED								REMEDY
	RUN	IN FAIL	EXT FAIL	SEL	IN1÷8	OSSD1/2	CLEAR1/2	STATUS1/2	
	GREEN	RED	RED	ORANGE	YELLOW	RED/GREEN	YELLOW	YELLOW	
Internal fault	OFF	2 or 3 flashes	OFF	Shows the physical address of the unit	OFF	Red	OFF	OFF	Return the unit to ReeR to be repaired
Compatibility error	OFF	5 flashes	OFF		5 flashes	5 flashes	5 flashes	5 flashes	• Firmware version not compatible with M1, return to ReeR for FW upgrade.
OSSD output error	OFF	4 flashes	OFF		OFF	4 flashes (only the LED corresponding to the output in FAIL mode)	OFF	OFF	• Check OSSD1/2 connections • If the problem persists, return the MI8O2 to ReeR to be repaired
Error in communication with master	OFF	5 flashes	OFF		OFF	OFF	OFF	OFF	• Restart the system • If the problem persists, return the MI8O2 to ReeR to be repaired
Error on other slave or M1	OFF	ON	OFF		OFF	OFF	OFF	OFF	• Restart the system • Check which unit is in FAIL mode
Same type of slave with same address detected	OFF	5 flashes	5 flashes		OFF	OFF	OFF	OFF	• Change the unit's address (see NODE SEL)

Table 31 - Troubleshooting MI8O2

English

MI8 (Figure 18)

Figure 18 - MI8

MEANING	LED								REMEDY
	RUN	IN FAIL	EXT FAIL	SEL	IN1÷8	OSSD1/2	CLEAR1/2	STATUS1/2	
	GREEN	RED	RED	ORANGE	YELLOW	RED/GREEN	YELLOW	YELLOW	
Internal fault	OFF	2 or 3 flashes	OFF	Shows the physical address of the unit	OFF	Red	OFF	OFF	Return the unit to ReeR to be repaired
Compatibility error	OFF	5 flashes	OFF		5 flashes	5 flashes	5 flashes	5 flashes	• Firmware version not compatible with M1, return to ReeR for FW upgrade.
Error in communication with master	OFF	5 flashes	OFF		OFF	OFF	OFF	OFF	• Restart the system • If the problem persists, return the MI8 to ReeR to be repaired
Error on other slave or M1	OFF	ON	OFF		OFF	OFF	OFF	OFF	• Restart the system • Check which unit is in FAIL mode
Same type of slave with same address detected	OFF	5 flashes	5 flashes		OFF	OFF	OFF	OFF	• Change the unit's address (see **NODE SEL**)

Table 32 - Troubleshooting MI8

MI16 (Figure 19)

Figure 19 - MI16
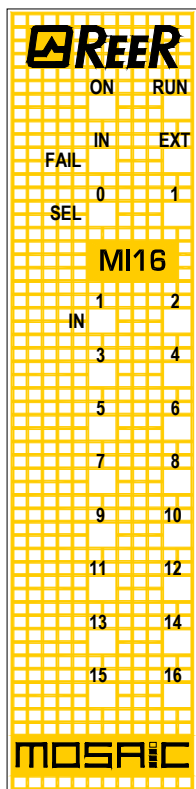
MEANING	LED								REMEDY
	RUN	IN FAIL	EXT FAIL	SEL	IN1÷16	OSSD1/2	CLEAR1/2	STATUS1/2	
	GREEN	RED	RED	ORANGE	YELLOW	RED/GREEN	YELLOW	YELLOW	
Internal fault	OFF	2 or 3 flashes	OFF	Shows the physical address of the unit	OFF	Red	OFF	OFF	Return the unit to ReeR to be repaired
Compatibility error	OFF	5 flashes	OFF		5 flashes	5 flashes	5 flashes	5 flashes	• Firmware version not compatible with M1, return to ReeR for FW upgrade.
Error in communication with master	OFF	5 flashes	OFF		OFF	OFF	OFF	OFF	• Restart the system • If the problem persists, return the MI16 to ReeR to be repaired
Error on other slave or M1	OFF	ON	OFF		OFF	OFF	OFF	OFF	• Restart the system • Check which unit is in FAIL mode
Same type of slave with same address detected	OFF	5 flashes	5 flashes		OFF	OFF	OFF	OFF	• Change the unit's address (see NODE SEL)

Table 33 - Troubleshooting MI16

English
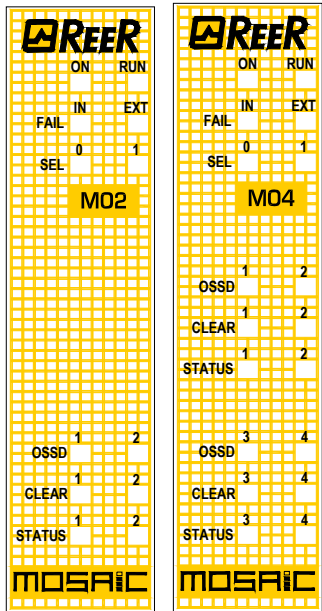
MO2 / MO4 (Figure 20)

Figure 20 - MO2 / MO4

MEANING	LED							REMEDY
	RUN	IN FAIL	EXT FAIL	SEL	OSSD1/4	CLEAR1/2	STATUS1/2	
	GREEN	RED	RED	ORANGE	RED/GREEN	YELLOW	YELLOW	
Internal fault	OFF	2 or 3 flashes	OFF	Shows the physical address of the unit	Red	OFF	OFF	Return the unit to ReeR to be repaired
Compatibility error	OFF	5 flashes	OFF		5 flashes	5 flashes	5 flashes	• Firmware version not compatible with M1, return to ReeR for FW upgrade.
OSSD output error	OFF	4 flashes	OFF		4 flashes (only the LED corresponding to the output in FAIL mode)	OFF	OFF	• Check OSSD1/2 connections • If the problem persists, return the MO2/4 to ReeR to be repaired
Error in communication with master	OFF	5 flashes	OFF		OFF	OFF	OFF	• Restart the system • If the problem persists, return the MI8O2 to ReeR to be repaired
Error on other slave or M1	OFF	ON	OFF		OFF	OFF	OFF	• Restart the system • Check which unit is in FAIL mode
Same type of slave with same address detected	OFF	5 flashes	5 flashes		OFF	OFF	OFF	• Change the unit's address (see **NODE SEL**)

Table 34 - Troubleshooting MO2/MO4

MOSAIC SAFETY DESIGNER SOFTWARE

The **"MOSAIC SAFETY DESIGNER"** application software can be used to configure a logic diagram of the connections between the MOSAIC (Master + expansions) and the components of the system being developed.

The MOSAIC and its SLAVE units will thus monitor and control the connected safety components.

The MSD uses a versatile graphic interface to establish the connections between the various components, as described below:

Installing the software

PC HARDWARE requirements

- RAM: 256 MB
  (adequate to run *Windows XP SP3 + Framework 3.5*)
- Hard disk: $\geq$ 100Mbyte of free space
- USB connector: 1.1 or 2.0
- CD-ROM drive

PC SOFTWARE requirements

- Windows XP with Service Pack 3 installed (or higher OS).

➔ Microsoft Framework 3.5 (or higher) must be installed on the PC

How to install MSD

- Insert the installation CD;
- Wait for the auto-run installer to request the SW setup program;

  Alternatively follow the path D:/;
- Double-click on the MOSAICSAFETYDESIGNER.MSI file;

  When the installation procedure is complete a window is displayed asking you to close the setup program.

Fundamentals

Once the MSD has been correctly installed it creates an icon on the desktop to launch the program: double-click on this icon. =>

The opening screen shown below is displayed:
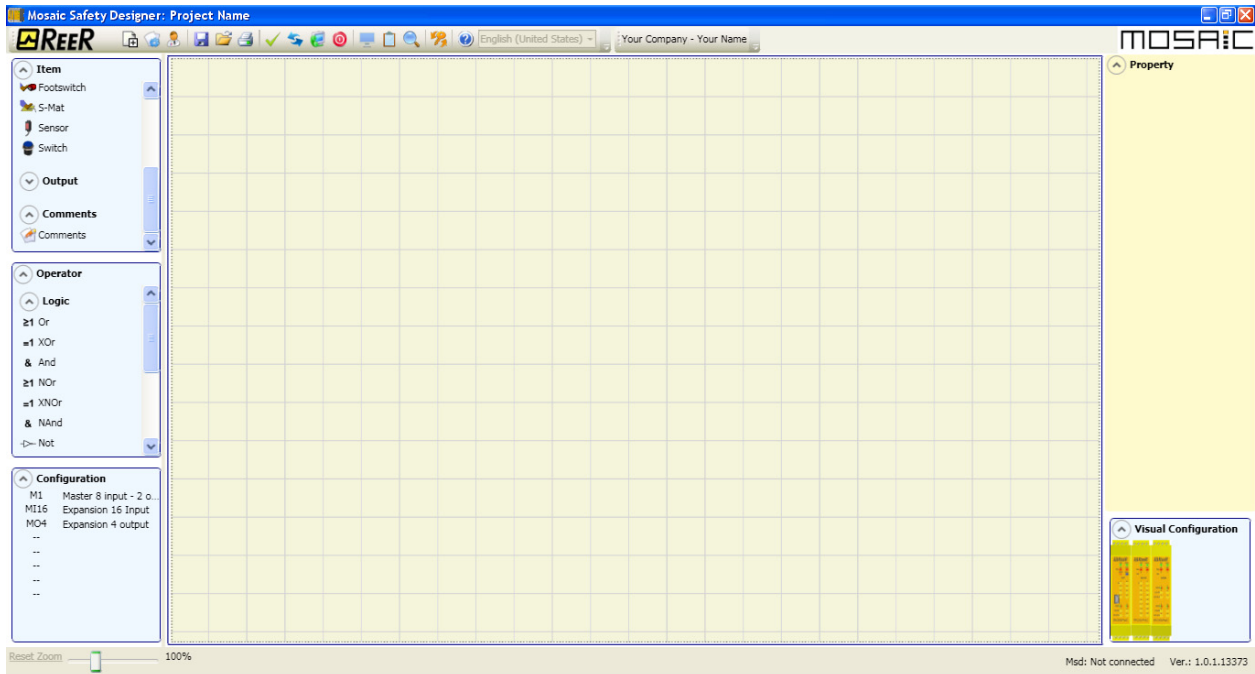
Figure 21

You are now ready to create your project.

Standard tool bar

The standard tool bar is shown in Figure 22. The meanings of the icons are listed below:

1 -> **CREATE A NEW PROJECT**

2 -> **CHANGE CONFIGURATION** (composition of different modules)

3 -> **CHANGE USER PARAMETERS** (name, company, etc)

4 -> **SAVE THE ACTUAL PROJECT**

5 -> **LOAD AN EXISTING PROJECT**

6 -> **PRINT THE PROJECT SCHEMATIC**

7 -> **VALIDATE THE PROJECT**

8 -> **CONNECT TO MOSAIC**

9 -> **SEND PROJECT TO MOSAIC**

10 -> **DISCONNECT FROM MOSAIC**

11 ->   **MONITOR** (Real time I/O status)

12 ->   **UPLOAD LOG FILE**

13 ->   **UPLOAD SYSTEM CONFIGURATION**

14 ->   **CHANGE PASSWORD**

15 ->   **ON-LINE HELP**

Figure 22

English

Create a new project (configure the MOSAIC system)

Select icon CREATE (Figure 22) from the standard tool bar to start a new project. The user authentication window is displayed (Figure 23).
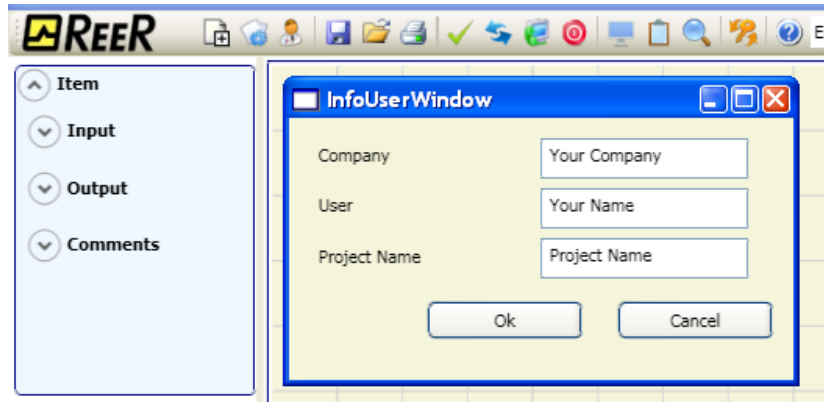
Figure 23

Next the MSD displays a window showing the M1 only.

You may add the various units needed to create your system, using the pull-down menus at the top of the screen (select slave) and at the bottom to select the relative node (0÷4).

.

SELECT SLAVE (to add to your configuration)
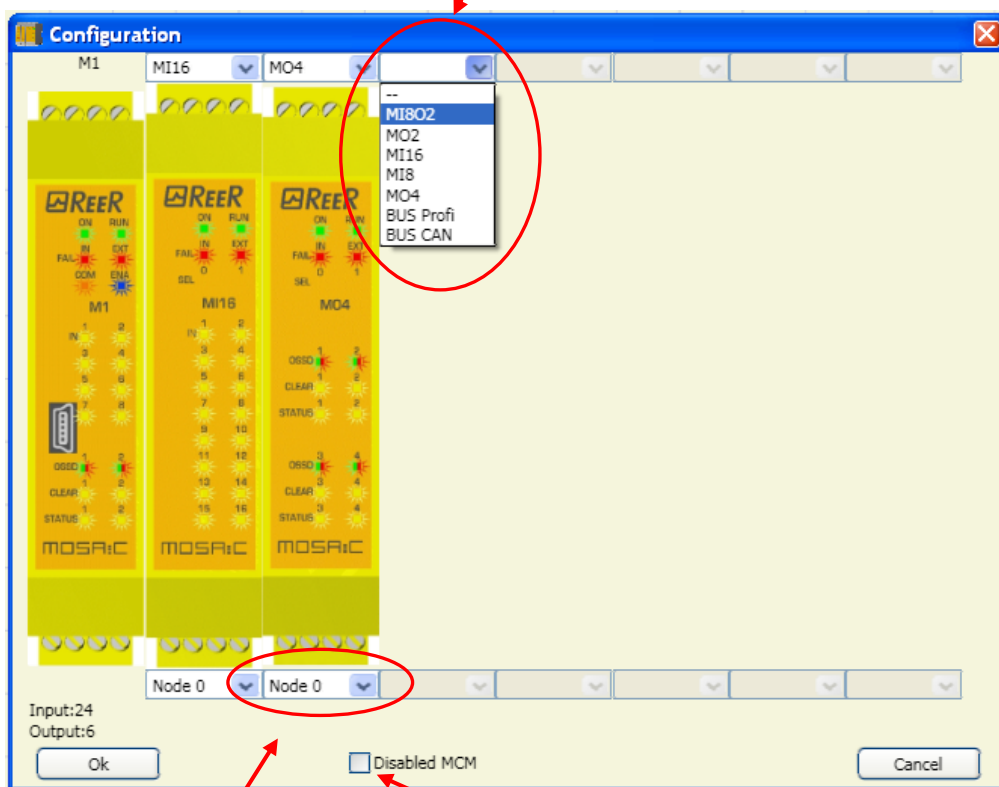
Figure 24

SELECT NODE (from 0 to 3)   Select to disable MCM operations

OBJECTS - OPERATOR - CONFIGURATION tool bars

Four large tool windows are displayed to the left and right of the main window (shown in Figure 25):
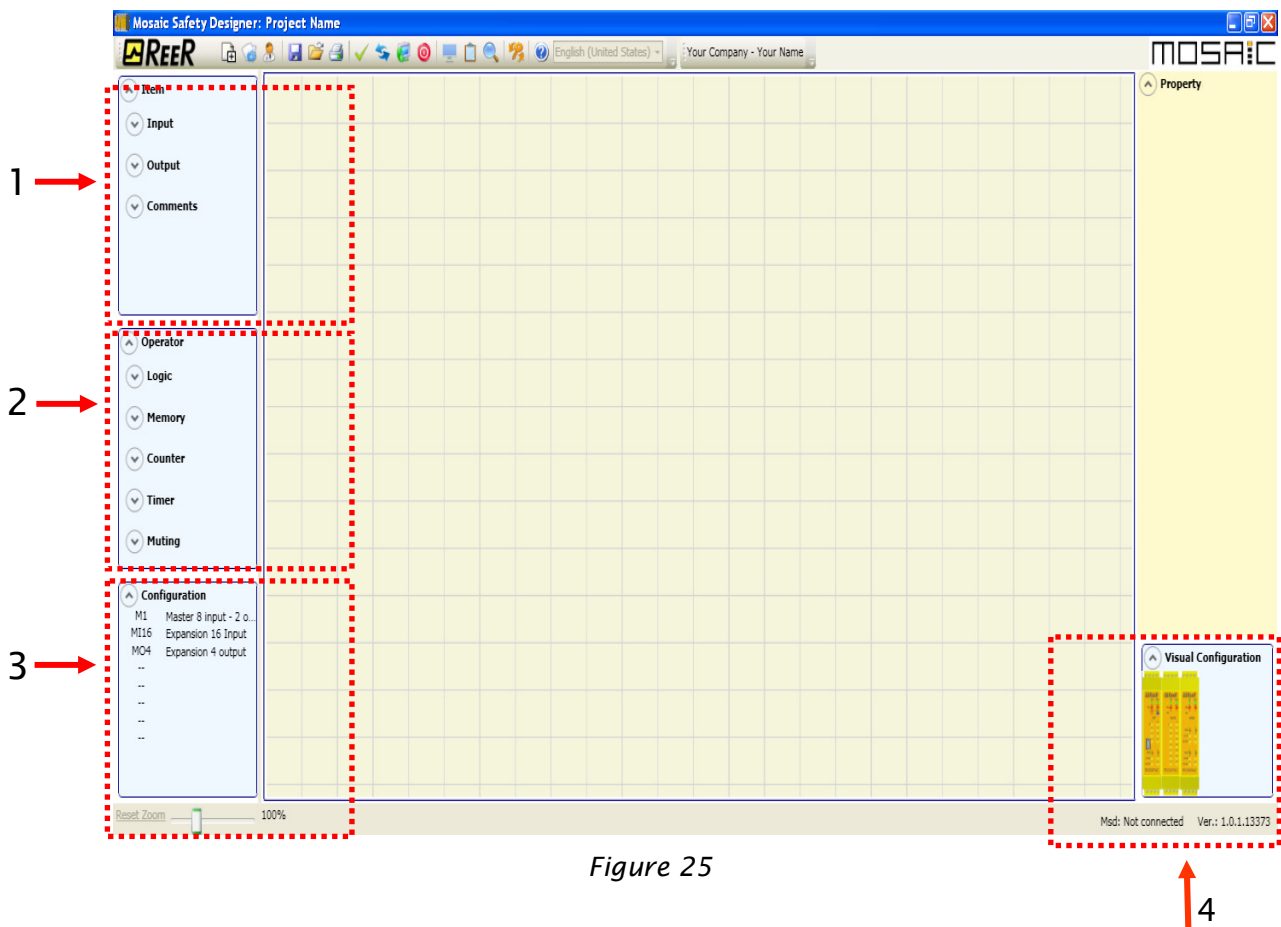
Figure 25

1 > OBJECT TOOL WINDOW

   This contains the various function blocks that will make up your project; these blocks are divided into 4 different types:

   - physical
   - inputs
   - outputs
   - comments

2 > OPERATOR TOOL WINDOW

   This contains the various function blocks for connecting the objects in point 1; these blocks are divided into 5 different types:

   - logical
   - muting
   - memories
   - counters
   - timers

3 > CONFIGURATION TOOL WINDOW

   This contains the description of your project composition.

4 > CONFIGURATION TOOL WINDOW (view)

   This contains the graphic representation of your project composition.

English

Creating the diagram (Figure 16)

Once you have selected your system composition, you are ready to configure the project.

The logic diagram is created using a **DRAG&DROP** function:

- Select the objects as required from the windows described previously (each single object is described in detail in the following sections) and drag it into the design area.
- Now when you select the object the **PROPERTIES** window is enabled, where you must fill in the fields as required.
- Connect the objects by moving the mouse over the required pin and then dragging it onto the pin to be connected.
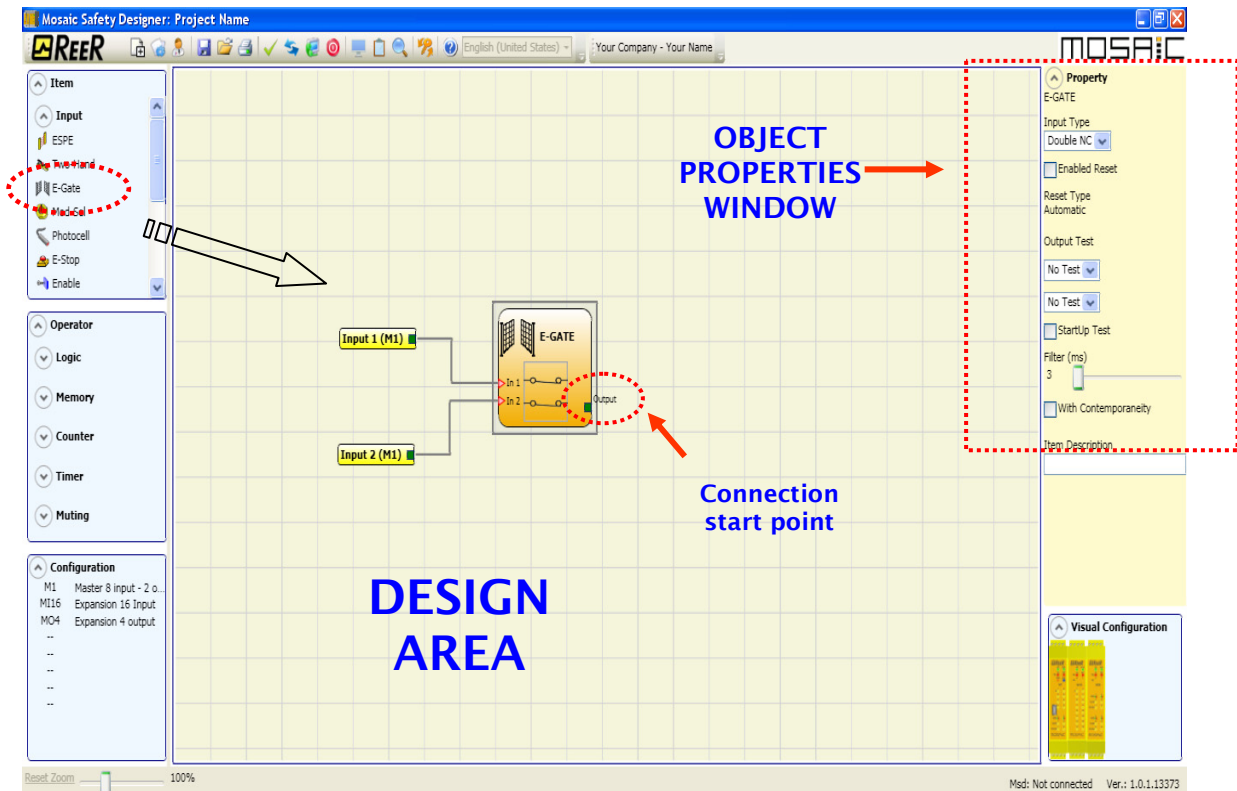
Figure 26

Example of a project

Figure 27 shows an example of a project in which the M1 unit only is connected to two safety blocks (E-GATE and E-STOP).

The M1 inputs (1,2,3) for connecting the contacts of the safety components are shown on the left, in yellow. The MOSAIC outputs (from 1 to 4) are activated according to the conditions defined in E-GATE and E-STOP (see the *E-GATE - E-STOP* sections).

By clicking on a block to select it, you enable the PROPERTIES WINDOW on the right, which you can use to configure the block activation and test parameters (see the *E-GATE - E-STOP* sections).
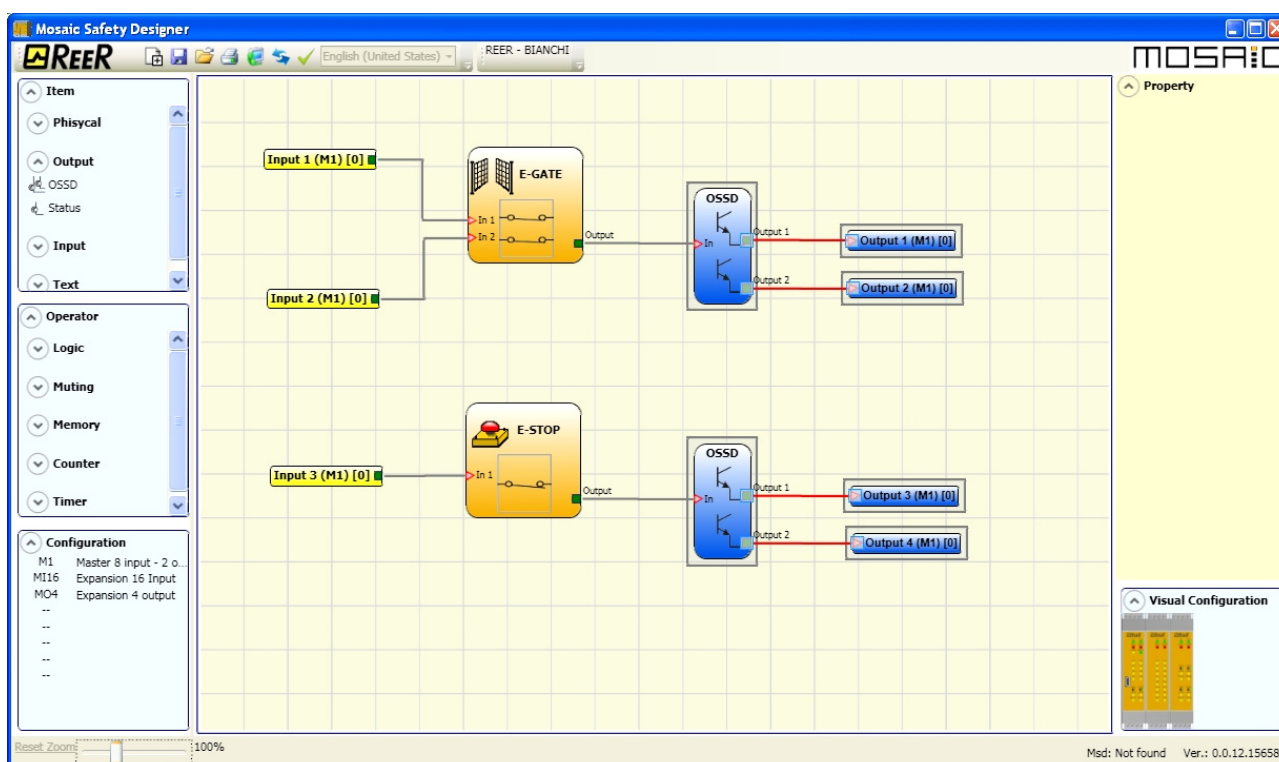
Figure 27

At the end of the project design stage (or at intermediate steps) you can save the current configuration using the icon **SAVE** on the standard tool bar.

Project validation

➔ Now the finished project must be verified. Execute the VALIDATE command (icon on the standard tool bar > *Standard tool bar*).

English

Sending the configuration to the MOSAIC

The last operation to be performed consists of send the stored configuration from the PC to the M1 (icon on the standard tool bar).

The M1 saves the project in its internal memory and in the MCM memory (if present).

Configuration LOG

➡ The **date of creation and Checksum** (logbook) of the project that are saved in the M1 internal memory are entered into the configuration file (project).

➡ This logbook can record up to 5 consecutive events, after which these are overwritten, starting from the least recent event.

The LOG file could be visualized by the icon present in the main menu.

Password protection

The MSD requests a password in order to upload and save the project.

Level 1 password

All operators using the M1 system must have a Level 1 PASSWORD.

This password only allows a project that has already been saved to be displayed. The first time the system is initialised the operator must use the password "" (ENTER key).

Designers who know the level 2 password can enter a new level 1 password (alphanumerical, max 8 characters).

➡ Operators who know this password **are not enabled** to upload, modify or save the project.

Level 2 password

Designers authorised to work on the creation of the project must know a Level 2 PASSWORD. The first time the system is initialised the operator must use the password **"REERSAFE"** (all capital letters).

Designers who know the level 2 password can enter a new level 2 password (alphanumerical, max 8 characters).

➡ This password **enables** the project to be uploaded, modified and saved. In other words, it allows total control of the PC => MOSAIC system.

➡ When a new project is UPLOADED the level 2 password could be changed.

➡ Should you forget either of these passwords, please contact ReeR for an unlocking password. This password is only given to the designer and can only be used once.

TESTING the system

⚠ After validating and uploading the project to the M1 and connecting all the safety devices, you must test the system to verify its correct operation.

This is done by forcing a change of status for each safety device connected to the MOSAIC to check that the status of the outputs actually changes.

The following example is helpful for understanding the TEST procedure.
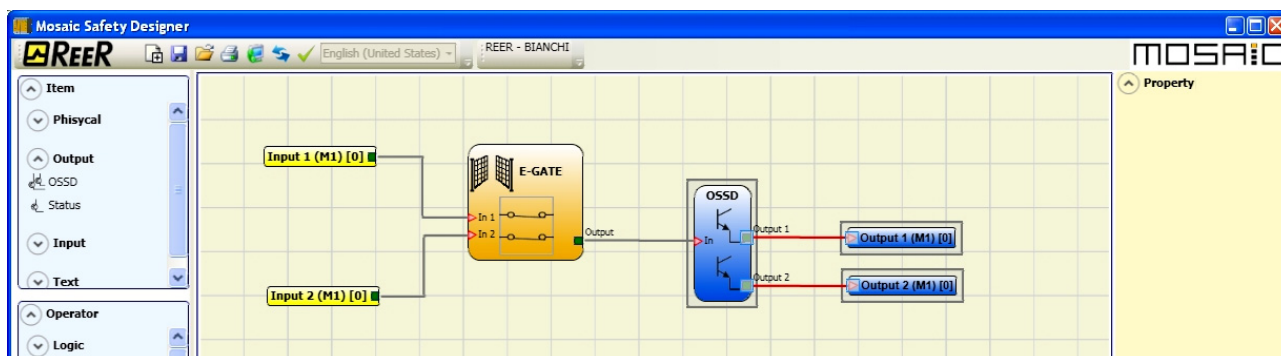
Figure 28

(t1) In the normal operating condition (E-GATE closed) Input1 is closed, Input2 is open and the output of the E-GATE block is set to high logic level; in this mode the safety outputs (OSSD1/2) are active and the power supply to the relative terminals is 24VDC.

(t2) When the E-GATE is **physically** opened, the condition of the inputs and thus of the outputs of the E-GATE block will change: (OUT= 0VDC--->24VDC); **the condition of the OSSD1-OSSD2 safety outputs will change from 24VDC to 0VDC.** If this change is detected the mobile E-GATE is connected correctly.

In1	*24vdc*		*0vdc*
In2	*0vdc*		*24vdc*
Output	*24vdc*		
OSSD1	*24vdc*		*0vdc*
OSSD2	*24vdc*		*0vdc*
		(t1)	(t2)
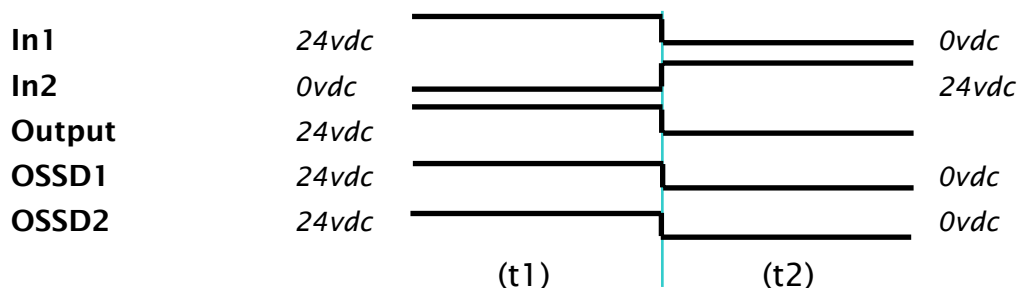
⚡ For the correct installation of each external sensor/component refer to their installation manual.

⚡ This test must be performed for each safety component in the project.

OBJECT FUNCTION BLOCKS

OUTPUT OBJECTS

OSSD (safety outputs)

The OSSD semiconductor safety outputs require no maintenance, Output1 and Output2 supply 24Vdc if the input is 1 (TRUE), whereas they supply 0Vdc if the input is 0 (FALSE).

Parameters

Enabled reset: If selected this enables the request to reset each time the input signal falls. Otherwise, enabling of the output directly follows the input conditions.
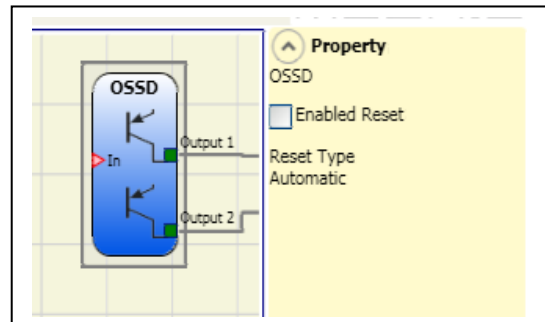
See RESTART_FBK for details.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

MANUAL
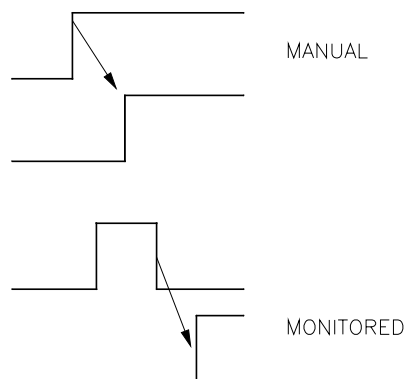
MONITORED

STATUS (signal output)

The STATUS output makes it possible to monitor any point on the diagram by connecting it to the input. The output returns 24Vdc if the input is 1 (TRUE), or 0Vdc if the input is 0 (FALSE).
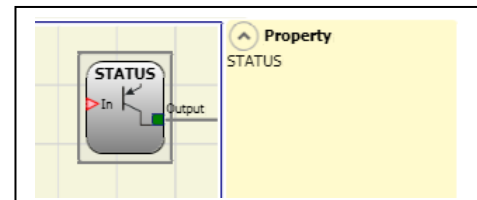
The STATUS output is NOT a safety output.

English

INPUT OBJECTS

E-STOP (emergency stop)

The E-STOP function block verifies the status of the inputs of an emergency stop device. If the emergency stop button has been pressed the output is 0 (FALSE). If not the output is 1 (TRUE)

Parameters

Input type:
- Single NC – allows connection of one-way emergency stops
- Double NC – allows connection of two-way emergency stops .

Enabled reset: If selected this enables the request to reset each time the emergency stop is activated. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

MANUAL

MONITORED

CONNECTION EXAMPLE (ONE CONTACT)

CONNECTION EXAMPLE (TWO CONTACTS)

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the emergency stop (mushroom pushbutton). This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the external component (emergency stop). This test is performed by pressing and releasing the pushbutton to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

English

Filter (ms): This is used to filter the signals coming from the emergency stop. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Concurrent enable: If selected this activates the test to verify concurrent switching of the signals coming from the emergency stop.

Concurrent (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the emergency stop.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

E-GATE (safety gate device)

The E-GATE function block verifies the input status of a mobile guard or safety gate device. If the mobile guard or safety gate is open, the output is 0 (FALSE). Otherwise the output is 1 (TRUE).
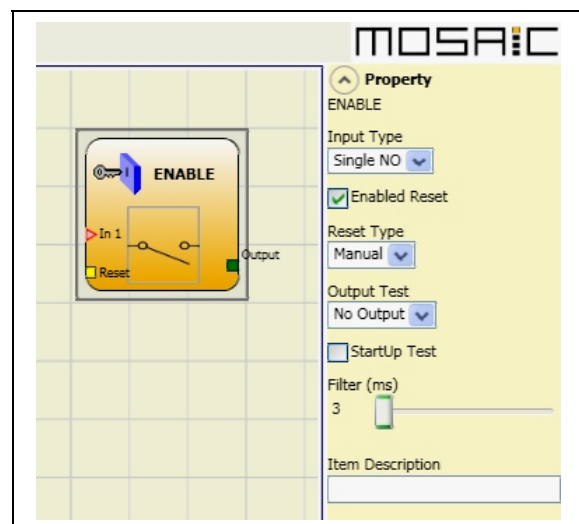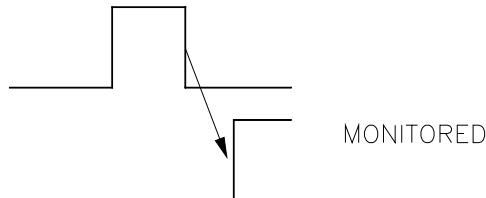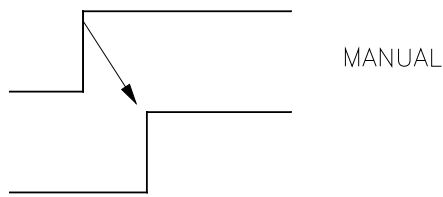
Parameters

Input type:
- Double NC – Allows connection of components with two NC contacts
- Double NC/NO – Allows connection of components with one NO contact and one NC.

Enable reset: If selected this enables the request to reset each time the mobile guard/safety gate is activated. Otherwise, enabling of the output directly follows the input conditions.
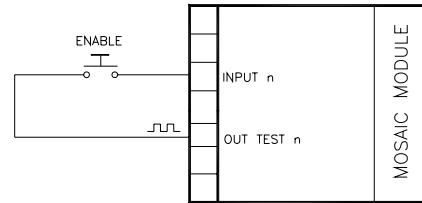

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

MANUAL

CONNECTION EXAMPLE (ONE CONTACT)

MONITORED

CONNECTION EXAMPLE (TWO CONTACTS)

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.
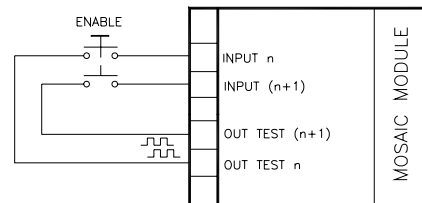
Output test: This is used to select which test output signals are to be sent to the component contacts. This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by opening the mobile guard or safety gate to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Concurrent enable: If selected this activates the test to verify concurrent switching of the signals coming from the external contacts.

Concurrent (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the external contacts.
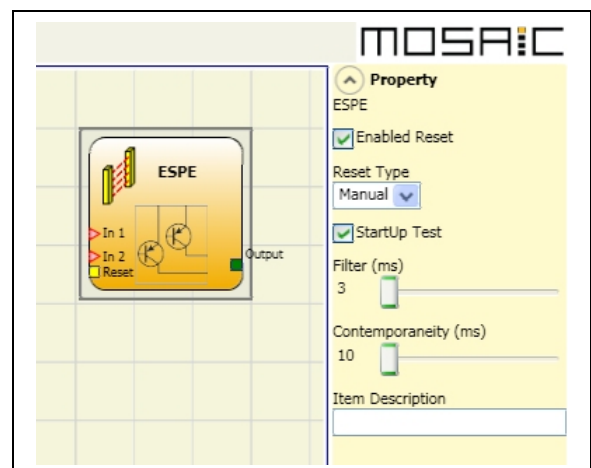
Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.
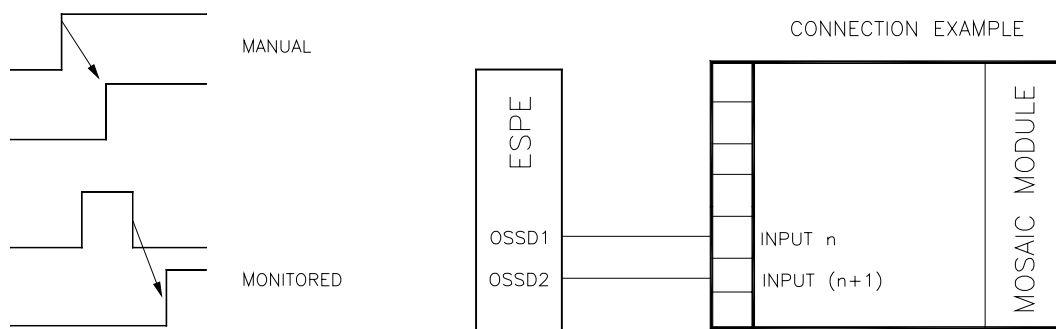
ENABLE (enable key)

The ENABLE function block verifies the status of the inputs of a key device. If the key is not turned the output is 0 (FALSE). Otherwise the output is 1 (TRUE)

Parameters

Input type
- Single NO – Allows connection of components with two NO contacts
- Double NO – Allows connection of components with two NO contacts.

Enable reset: If selected this enables the request to reset each time the mobile guard/safety gate is activated. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

English

Input test: This is used to select which test output signals are to be sent to the component contacts. This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by opening the mobile guard or safety gate to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Concurrent enable: If selected this activates the test to verify concurrent switching of the signals coming from the external contacts.

Concurrent (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the external contacts.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

ESPE (optoelectronic safety light curtain)

The ESPE function block verifies the state of the inputs of an optoelectronic safety light curtain. If the area protected by the light curtain is occupied, (light curtain outputs FALSE) the output is 0 (FALSE). Otherwise, with the area clear and outputs to 1 (TRUE) the output is 1 (TRUE)

Parameters

Enable reset: If selected this enables the request to reset each time the area protected by the safety light curtain is occupied. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

Test at start-up: If selected this enables the test at start-up of the safety light curtain. This test is performed by occupying and clearing the area protected by the safety light curtain to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the safety light curtain. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Concurrent enable: If selected this activates the test to verify concurrent switching of the signals coming from the safety light curtain.

Concurrent (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the safety light curtain.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

English

FOOTSWITCH (safety pedal)

The FOOTSWITCH function block verifies the status of the inputs of a safety pedal device. If the pedal is not pressed the output is 0 (FALSE). Otherwise the output is 1 (TRUE).
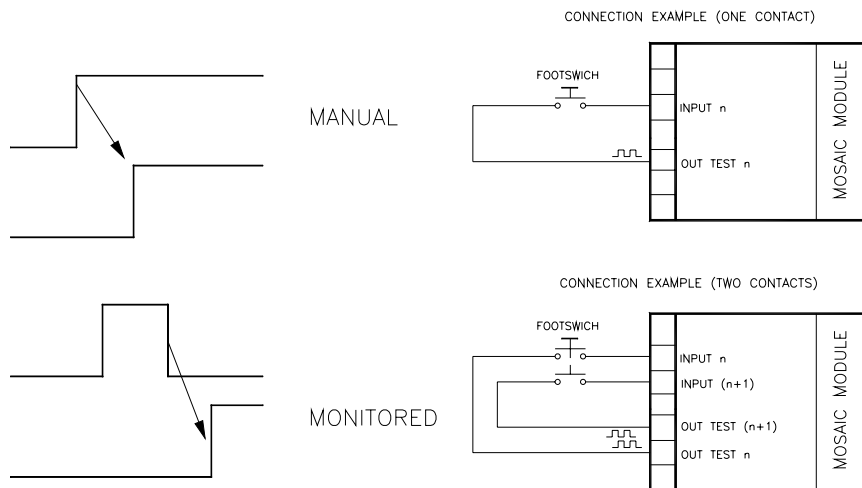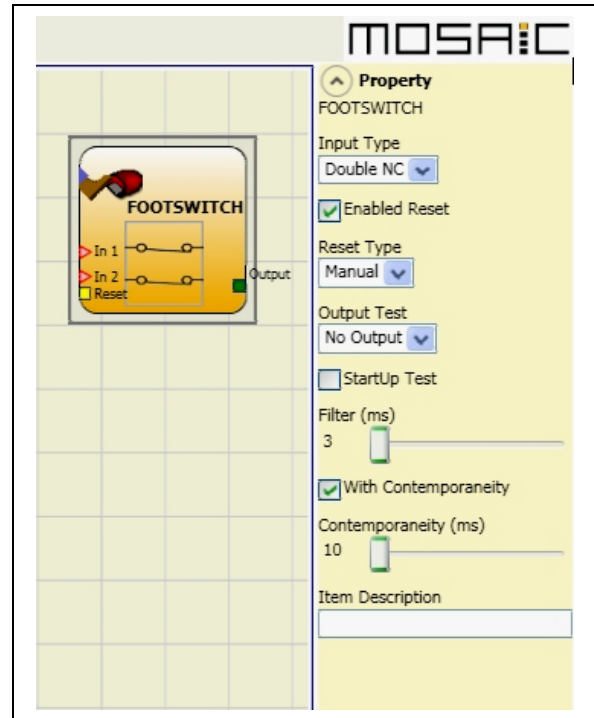
Parameters

Input type:
- Single NC – Allows connection of pedals with two NC contacts
- Single NO – Allows connection of pedals with one NO contact and one NC.
- Double NC – Allows connection of pedals with two NC contacts
- Double NC/NO – Allows connection of pedals with one NO contact and one NC.

Enabled reset: If selected this enables the request to reset each time the mobile guard/safety gate is activated. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the component contacts. This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by opening the mobile guard or safety gate to run a complete

function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.
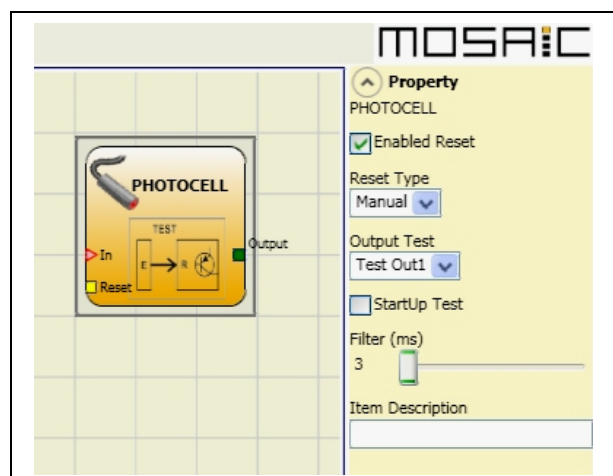
Concurrent enable: If selected this activates the test to verify concurrent switching of the signals coming from the external contacts.

Concurrent (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the external contacts.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

MOD-SEL (safety selector)

The MOD-SEL function block verifies the status of the inputs from a mode selector (up to 4 inputs): If only one input is 1 (TRUE) the corresponding output is also 1 (TRUE). In all other cases, and thus when all inputs are 0 (FALSE) or more than one input is 1 (TRUE) all the outputs are 0 (FALSE)

Parameters
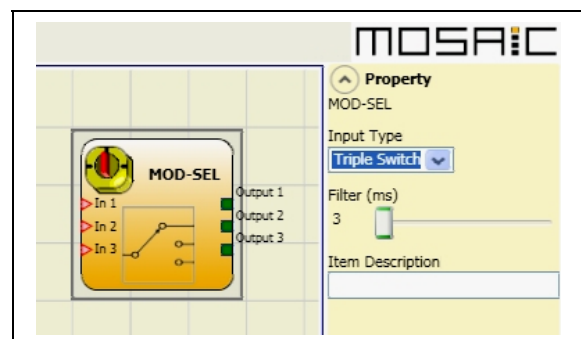
Input type:
- Double selector – Allows connection of two-way mode selectors.
- Triple selector – Allows connection of three-way mode selectors.
- Quadruple selector - Allows connection of four-way mode selectors.

Filter (ms): This is used to filter the signals coming from the mode selector. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.
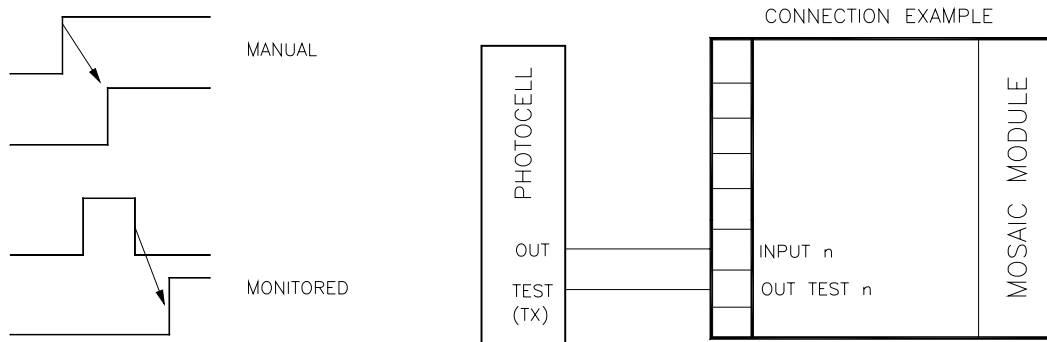
PHOTOCELL (safety photocell)

The PHOTOCELL function block verifies the status of the inputs of an optoelectronic safety photocell. If the beam of the photocell is occupied (photocell output FALSE) the output is 0 (FALSE). Otherwise with the beam clear and an output of 1 (TRUE) the output is 1 (TRUE).

Parameters

Enabled reset: If selected this enables the request to reset each time the mobile guard/safety gate is activated. Otherwise, enabling of the output directly follows the input conditions.

English

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 is used for the fuctional block, then Input 2 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the photocell contacts. This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by opening the mobile guard or safety gate to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

TWO-HAND

The TWO HAND function block verifies the status of the inputs of a two hand control switch. Only if both the press-buttons are pressed within 500 msec the output is 1 (TRUE). Otherwise the output is 0 (FALSE).

Input type:
- Double INPUT – Allows connection of two-hand switch with one NO contact for each button.
- Quadruple selector - Allows connection of two-hand switch with two NO contact for each button.
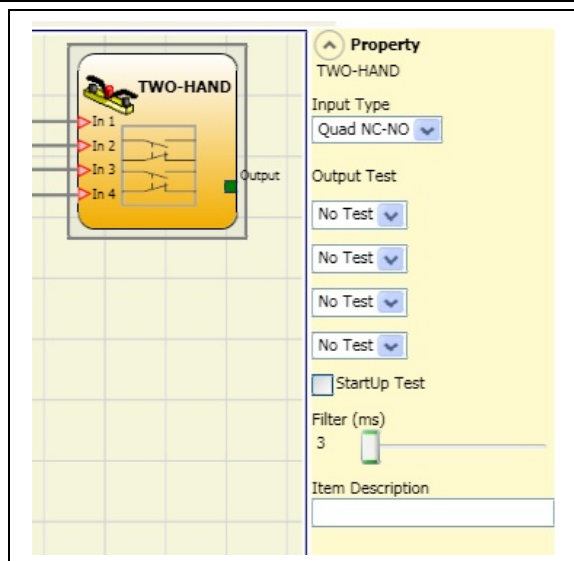
Output test: This is used to select which test output signals are to be sent to the component contacts. This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by pressing the two buttons (within 500 msec) and releasing them to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the mode selector. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.
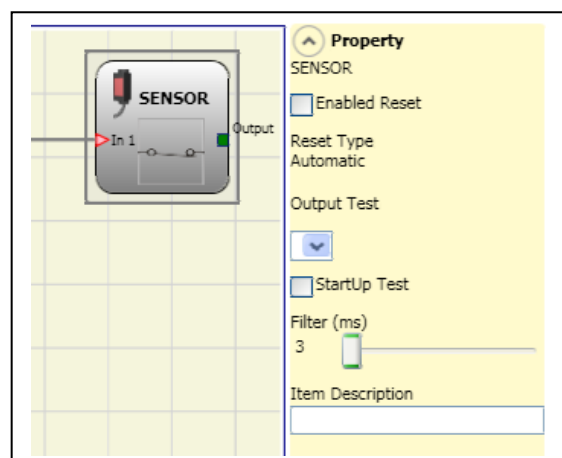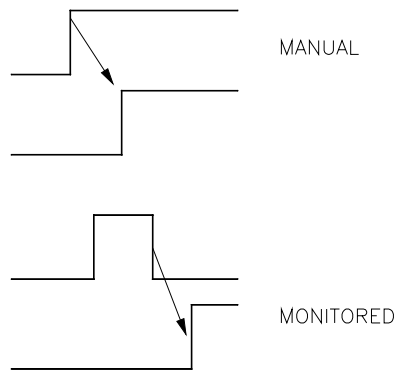
SENSOR (sensor)

The SENSOR function block verifies the status of the input of a sensor (not a safety sensor). If the beam of the sensor is occupied (sensor output FALSE) the output is 0 (FALSE). Otherwise, with the beam clear and an output of 1 (TRUE) then the output is 1 (TRUE).

Parameters

Enabled reset: If selected this enables the request to reset each time the area protected by the light curtain is occupied. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

English

MANUAL

MONITORED

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 is used for the fuctional block, then Input 2 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the emergency stop (mushroom pushbutton). This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the safety light curtain. This test is performed by occupying and clearing the area protected by the safety light curtain to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the safety light curtain. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.
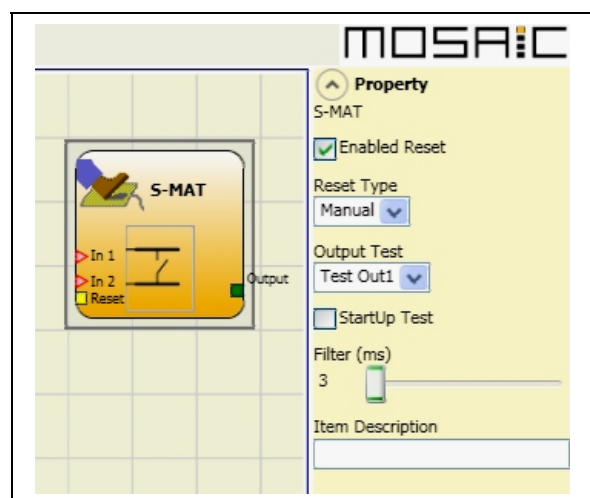
S-MAT (safety mat)

The S-MAT function block verifies the status of the inputs of a safety mat. If a person stands on the mat the output is 0 (FALSE). Otherwise, with the mat clear, the output is 1 (TRUE)
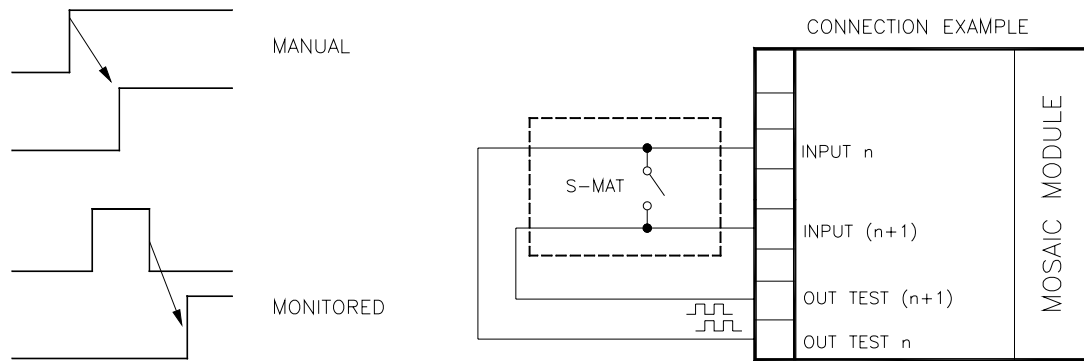
Parameters

Enabled reset: If selected this enables the request to reset each time the mobile guard/safety gate is activated. Otherwise, enabling of the output directly follows the input conditions.
There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1.
If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

English

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the mat contact. This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by opening the mobile guard or safety gate to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.
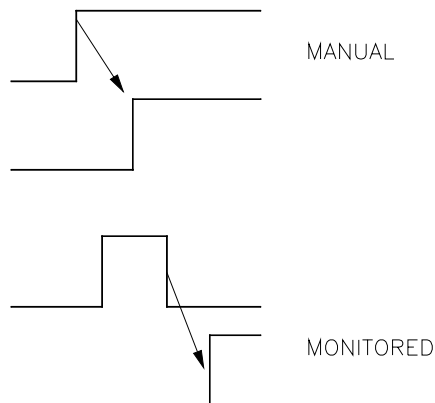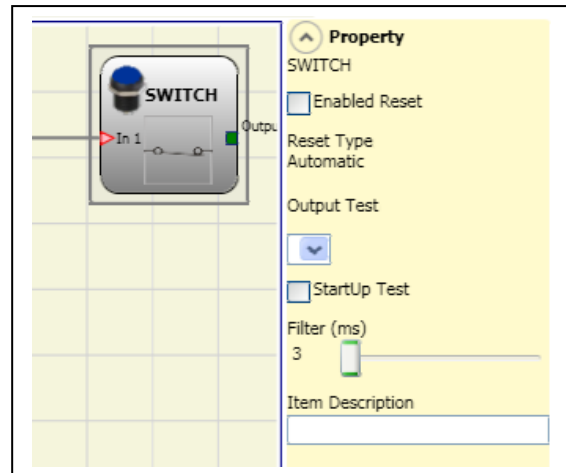
English

SWITCH

The SWITCH function block verifies the status of the input of a pushbutton or switch (not safety switches). If the pushbutton is pressed the output is 1 (TRUE). Otherwise, the output is 0 (FALSE).

Parameters

Enabled reset: If selected this enables the request to reset each time the area protected by the safety light curtain is occupied. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

MANUAL

MONITORED

ATTENTION: If the Enabled Reset is active, a consecutive Input have to be used. Example : Input 1 is used for the fuctional block, then Input 2 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the emergency stop (mushroom pushbutton). This additional test makes it possible to detect and manage any short-circuits between the lines. There is a choice of 4 possible test output signals, Test Output 1 ÷ Test Output 4.

Test at start-up: If selected this enables the test at start-up of the safety light curtain. This test is performed by occupying and then clearing the area protected by the safety light curtain to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the safety light curtain. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Object description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

COMMENTS

This allows a description to be entered and placed in any point of the diagram.
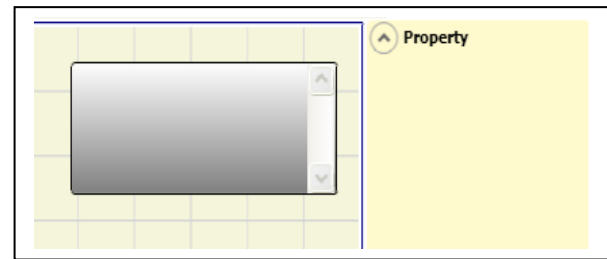
OPERATOR FUNCTION BLOCKS

All the input of these operators could be inverted (logical NOT). It could be done clicking with the right mouse key on the input to be inverted. A little circle will be showed on the inverted input. To cancel the inversion, simply click another time on the same input pin.

LOGICAL OPERATORS

AND

Logical AND returns an output of 1 (TRUE) if all the inputs are 1 (TRUE).

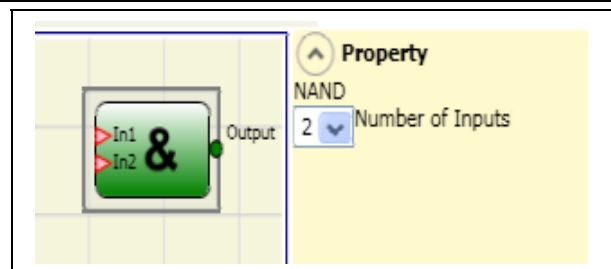| In$_1$	In$_2$	In$_x$	Out
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1
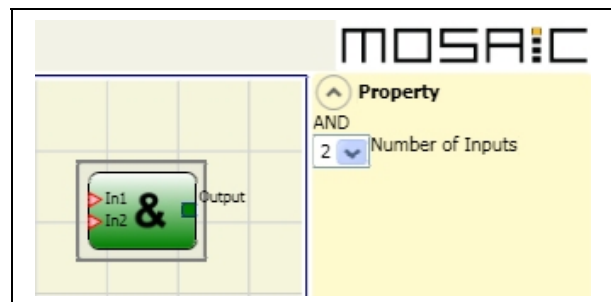
Parameters

Number of inputs: this is used to set between 1 and 8 inputs.

NAND

Logical NAND returns an output of 0 (FALSE) if all the inputs are 1 (TRUE).

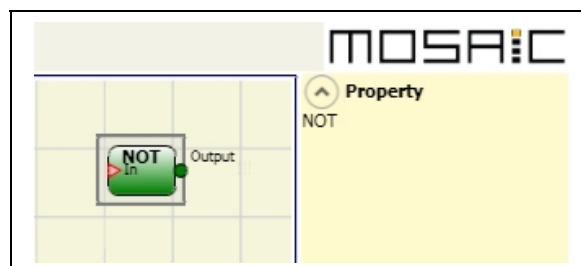| In$_1$	In$_2$	In$_x$	Out
0	0	0	1
1	0	0	1
0	1	0	1
1	1	0	1
0	0	1	1
1	0	1	1
0	1	1	1
1	1	1	0

English

Parameters

Number of inputs: this is used to set between 1 and 8 inputs.

NOT

Logical NOT inverts the logical status of the input.

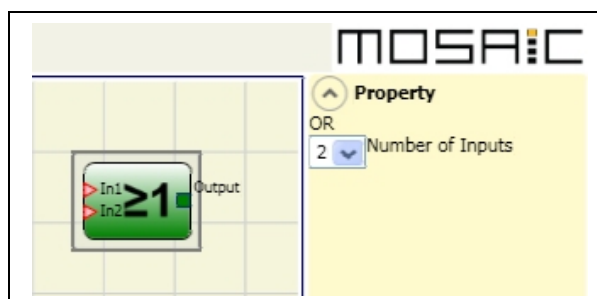| In	Out
0	1
1	0

OR

Logical OR returns an output of 1 (TRUE) if at least one of the inputs is 1 (TRUE).

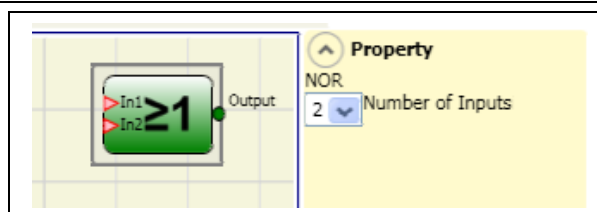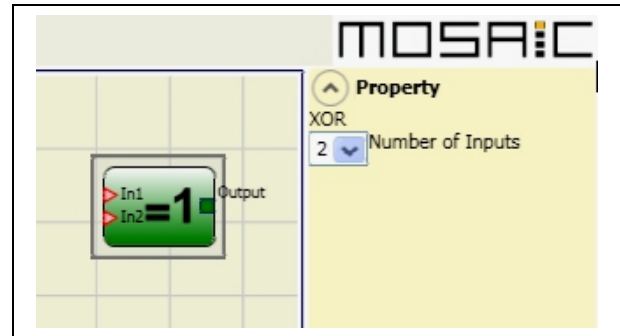| In$_1$	In$_2$	In$_x$	Out
0	0	0	0
1	0	0	1
0	1	0	1
1	1	0	1
0	0	1	1
1	0	1	1
0	1	1	1
1	1	1	1

Parameters

Number of inputs: this is used to set between 1 and 8 inputs.

NOR

Logical OR returns an output of 0 (FALSE) if at least one of the inputs is 1 (TRUE).

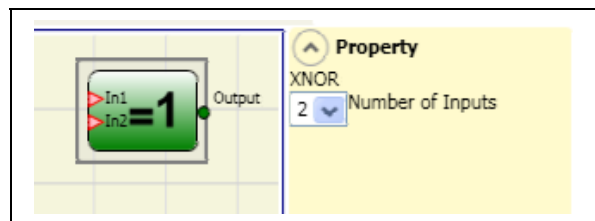| In$_1$	In$_2$	In$_x$	Out
0	0	0	1
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	0

Parameters

Number of inputs: this is used to set between 1 and 8 inputs.

English

XOR

Logical XOR returns an output of 0 (FALSE) if all the inputs are in the same state 0 (FALSE) or 1 (TRUE).

In$_1$	In$_2$	In$_x$	Out
0	0	0	0
1	0	0	1
0	1	0	1
1	1	0	1
0	0	1	1
1	0	1	1
0	1	1	1
1	1	1	0

Parameters

Number of inputs: this is used to set between 1 and 8 inputs.

XNOR

Logical XNOR returns an output of 1 (TRUE) if all the inputs are in the same state 0 (FALSE) or 1 (TRUE).

| In$_1$	In$_2$	In$_x$	Out
0	0	0	1
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1

Parameters

Number of inputs: this is used to set between 1 and 8 inputs.

MULTIPLEXER

Logical MULTIPLEXER forwards the signal of the inputs to the output according to the Sel selection. If the SEL1÷SEL4 have only one bit set, the selected *Inn* is connected to the Output. In all the other cases the output is set to 0 (FALSE) independently from the *Inn* values.

English
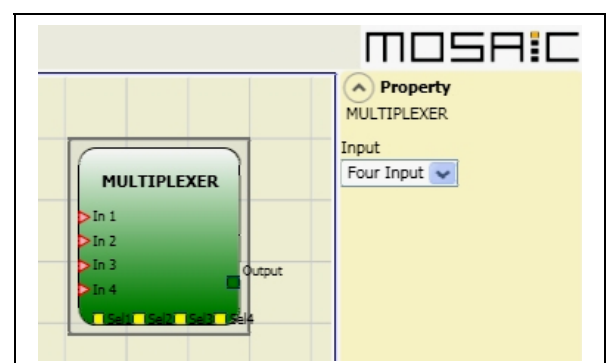
Parameters

Number of inputs: this is used to set between 1 and 4 inputs.
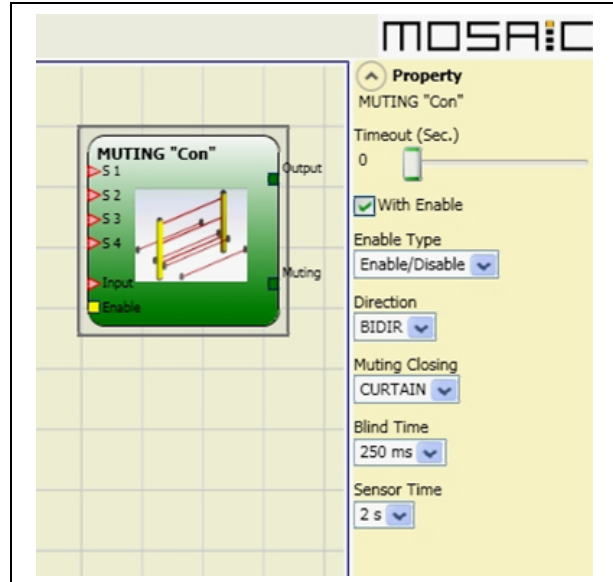
MUTING OPERATORS

"Concurrent" MUTING

The MUTING operator with "Concurrent" logic performs muting of the input signal through sensor inputs S1, S2, S3 and S4.

The Muting cycle can only start if all the sensors are 0 (FALSE) and inputs are 1 (TRUE).

Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.

Enable: If selected it enables the possibility of enabling or not enabling the Muting function. Otherwise the Muting function is always enabled.

There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next Muting cycle.

Direction: The order in which the sensors are occupied can be set. If set to BIDIR they can be occupied in both directions, from S1&S2 to S3&S4 and from S3&S4 to S1&S2, if set to UP they can be occupied from S1&S2 to S3&S4 and if set to DOWN from S3&S4 to S1&S2.

Muting Close: There are two types, CURTAIN and SENSOR. If you select CURTAIN muting closes when the input signal rises, if you select SENSOR it closes when the last sensor has been cleared.

Select CURTAIN

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	1	1	0	0	1
1	1	X	0	0	1
1	1	X	1	1	1
0	0	0	1	1	1
0	0	1	1	1	0
0	0	1	0	0	0

Select SENSOR

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	1	1	0	0	1
1	1	X	0	0	1
1	1	X	1	1	1
0	0	0	1	1	1
0	0	1	1	1	1
0	0	1	0	0	0

Blind Time: **Only with Muting Close=Curtain**, *blind time* is enabled if you know that after the complete transition of the pallet (muting cycle close) some protruding objects could still occupy the light curtain and send the input to 0 (FALSE). During blind time the input remains 1 (TRUE). Blind Time can range from 250 msecs to 1 second.

Sensor time: A difference of between 2 and 5 seconds can be set for activating the sensors.

MUTING "L"

The MUTING operator with "L" logic performs muting of the input signal through sensor inputs S1 and S2.
The Muting cycle can only start if S1 and S2 are 0 (FALSE) and the input is 1 (TRUE).

Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.
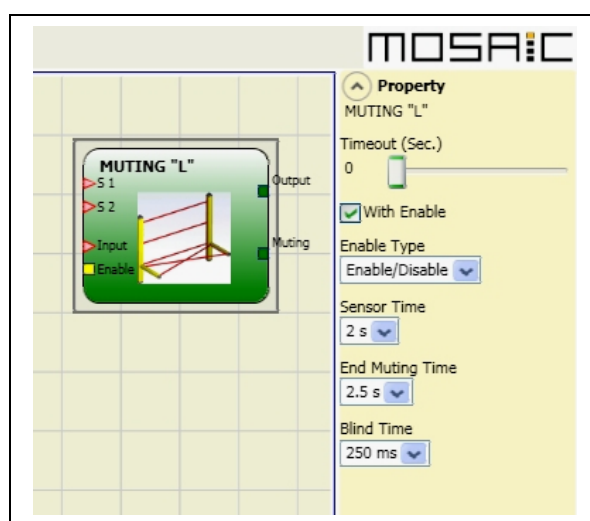
Enable: If selected it enables the possibility of enabling or not enabling the Muting function.
Otherwise the Muting function is always enabled.
There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next Muting cycle.

Sensor time: A difference of between 2 and 5 seconds can be set for activating the sensors.

End of Muting time: Sets the muting falling time, from 2.5 to 6 seconds, after the second sensor has been cleared.

Blind Time: enabled if you know that after the complete transition of the pallet (muting cycle close) some protruding objects could still occupy the light curtain and send the input to 0 (FALSE). During blind time the input remains 1 (TRUE). Blind Time can range from 250 msecs to 1 second.

English

"Sequential" MUTING

The MUTING operator with "Sequential" logic performs muting of the input signal through sensor inputs S1, S2, S3 and S4.
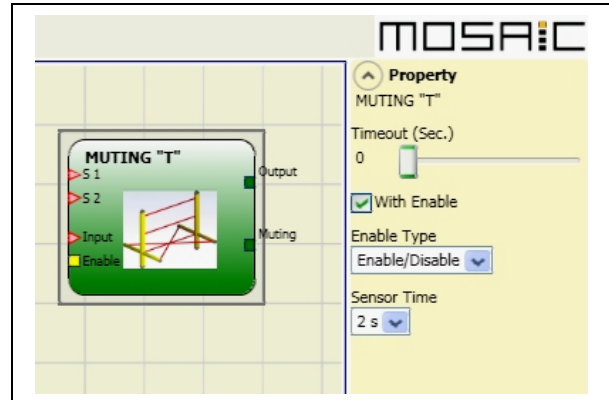The Muting cycle can only start if all the sensors are 0 (FALSE) and the inputs are 1 (TRUE).

Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.

Enable: If selected it enables the possibility of enabling or not enabling the Muting function. Otherwise the Muting function is always enabled.
There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next Muting cycle.

Direction: The order in which the sensors are occupied can be set. If set to BIDIR they can be occupied in both directions, from S1 to S4 and from S4 to S1, if set to UP they can be occupied from S1 to S4 and if set to DOWN from S4 to S1.

Muting Close: There are two types, CURTAIN and SENSOR. If you select CURTAIN muting closes when the input signal rises, if you select SENSOR it closes when the last sensor has been cleared.
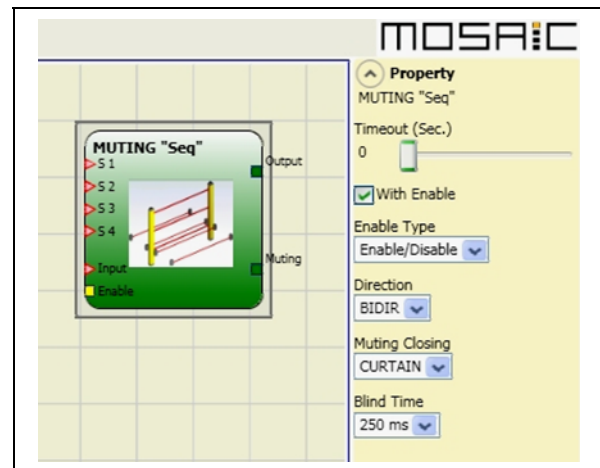
Select CURTAIN

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	1
1	1	X	0	0	1
1	1	X	1	0	1
1	1	X	1	1	1
0	1	X	1	1	1
0	0	0	1	1	1
0	0	1	1	1	0
0	0	1	0	1	0
0	0	1	0	0	0

Select SENSOR

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	1
1	1	X	0	0	1
1	1	X	1	0	1
1	1	X	1	1	1
0	1	X	1	1	1
0	0	0	1	1	1
0	0	1	1	1	1
0	0	1	0	1	0
0	0	1	0	0	0

Blind Time: **<u>Only with Muting Close=Curtain</u>**, *blind time* is enabled if you know that after the complete transition of the pallet (muting cycle close) some protruding objects could still occupy the light curtain and send the input to 0 (FALSE). During blind time the input remains 1 (TRUE). Blind Time can range from 250 msecs to 1 second.

MUTING "T"

The MUTING operator with "T" logic performs muting of the input signal through sensor inputs S1 and S2.
The Muting cycle can only start if S1 and S2 are 0 (FALSE) and the inputs are 1 (TRUE).

Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.

Enable: If selected it enables the possibility of enabling or not enabling the Muting function. Otherwise the Muting function is always enabled.
There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next Muting cycle.
Sensor time: A difference of between 2 and 5 seconds can be set for activating the sensors.

English

MEMORY OPERATORS

MEMORY operators can be used if you decide to save any data (TRUE or FALSE) from other project components.

Status changes are performed according to the truth tables shown for each operator.

D FLIP FLOP

The D FLIP FLOP operator saves the previously set status on output Q according to the following truth table.

| Preset	Clear	Ck	D	Q
1	0	X	X	1
0	1	X	X	0
1	1	X	X	0
0	0	L	X	Keep memory
0	0	Rising edge	1	1
0	0	Rising edge	0	0
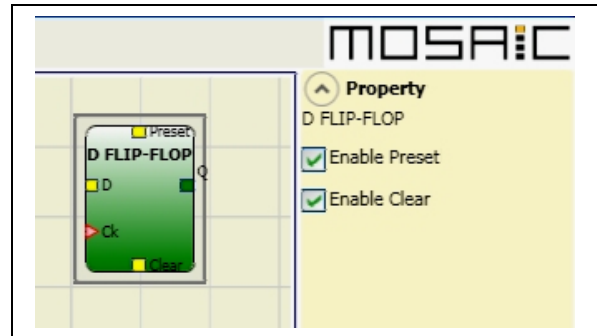
Parameters

Preset: If selected enables output Q to be set to 1 (TRUE).

Clear: If selected enables the saving process to be reset.

SR FLIP FLOP

The SR FLIP FLOP operator saves the previously set status on output Q using Set and Reset according to the following truth table.

SET	RESET	Q
0	0	Keep memory
0	1	0
1	0	1
1	1	0
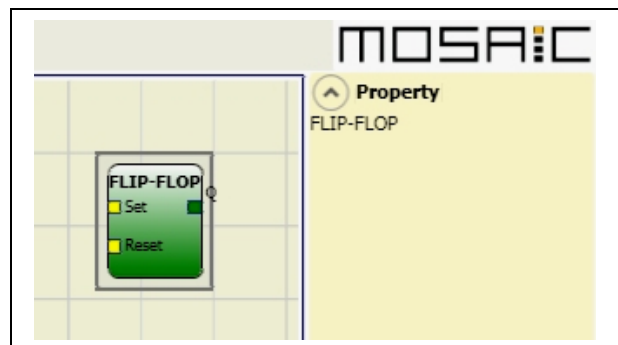
USER RESTART MANUAL

The USER RESTART MANUAL operator saves the restart signal according to the following truth table.

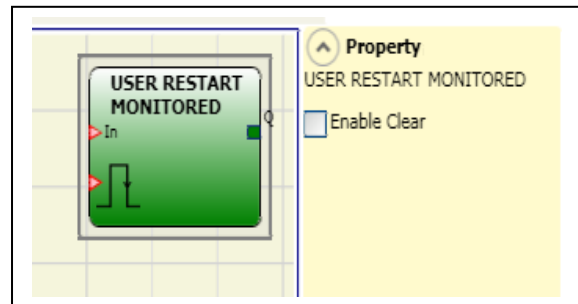| Clear	Restart	In	Q
1	X	X	0
X	X	0	0
0	L	1	Keep memory
0	Rising edge	1	1
0	Falling edge	1	Keep memory
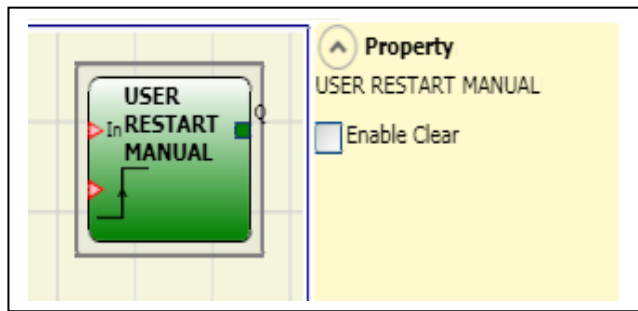
Parameters

Clear enable: If selected enables the saving process to be reset.

USER RESTART MONITORED

The USER RESTART MONITORED operator is used to save the restart signal according to the following truth table.

Clear	Restart	In	Q
1	X	X	0
X	X	0	0
0	L	1	Keep memory
0	Rising edge	1	Keep memory
0	⊓	1	1

Parameters

Clear enable: If selected enables the saving process to be reset.

English

COUNTER OPERATORS

COUNTER operators can be used to generate a signal (TRUE) as soon as the set count is reached.

COUNTER

The COUNTER operator is a pulse counter that sets output Q to 1 (TRUE) as soon as the set count is reached.

Parameters

Clear Enable: If selected this enables the request to clear in order to restart the counter setting output Q to 0 (FALSE). It also offers the possibility of enabling or not enabling (*Automatic Enable*) automatic operation with manual reset.
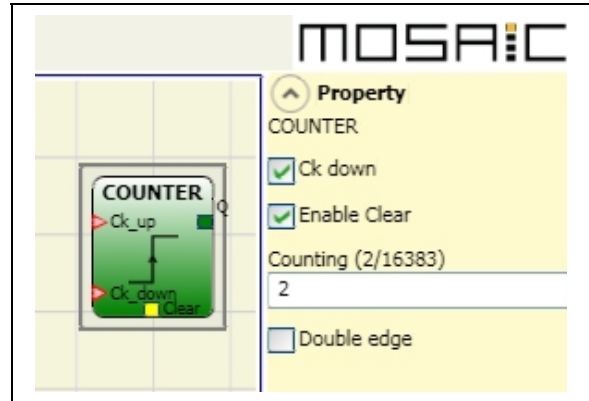
If this is not selected operation is automatic. Once the set count is reached output Q is set to 1(TRUE) and stays in this condition for two internal MOSAIC cycles after which it is reset.

Ck down: Enables counting down.
Two-way: If selected it enables counting on both the rising and falling edges.

TIMER OPERATORS

TIMER operators allow you to generate a signal (TRUE or FALSE) for a user-definable period.

CLOCKING

The CLOCKING operator generates a clock signal output with the set period if the input is 1 (TRUE).

Parameters

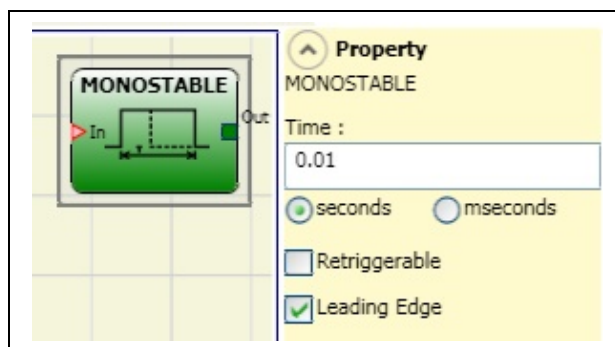*Time*: The period can be set to between **10 ms and 1093.3 s.**

English
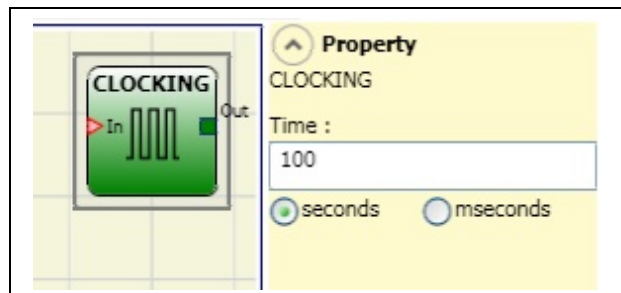
MONOSTABLE

The MONOSTABILE operator generates a level 1 (TRUE) output activated by the rising edge of the input and remains in this condition for the set time.

Parameters

Time: The delay can be set to between 10 ms and 1093.3 s.

Rising edge: If selected, the output is set to 1 (TRUE) on the input signal's rising edge where it remains for the set time, which can be extended for as long as the input stays at 1 (TRUE).
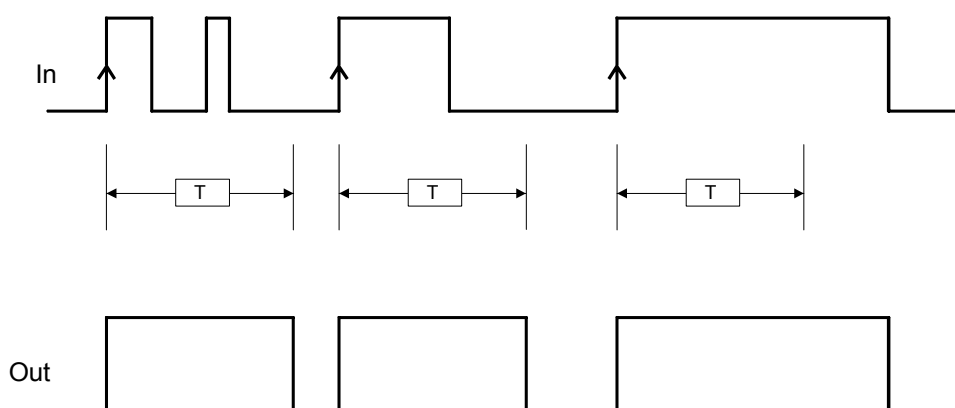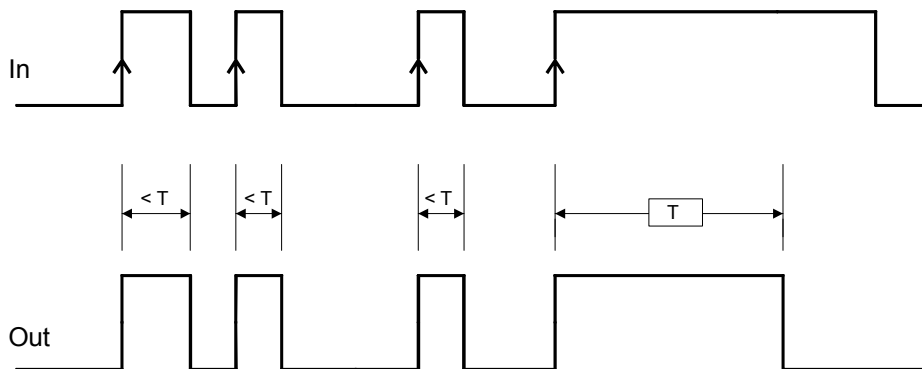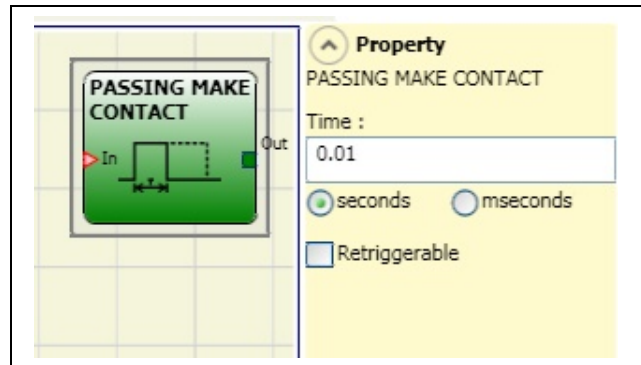
If not selected the logic is inverted, the output is set to 0 (FALSE) on the input signal's falling edge, where it remains for the set time, which can be extended for as long as the input stays at 0 (FALSE).
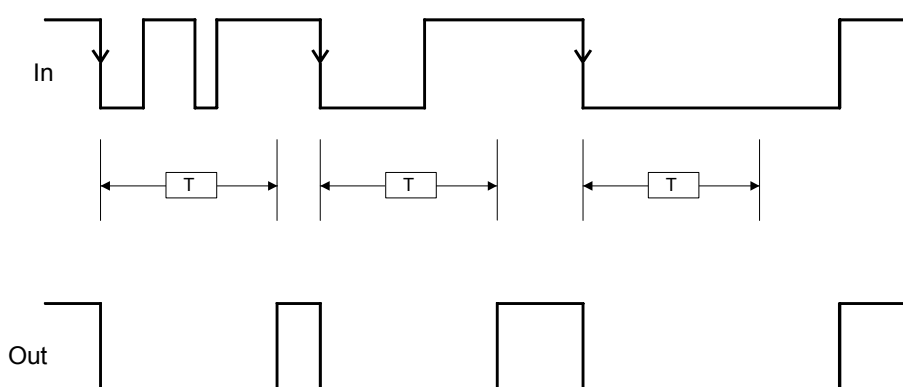
Retriggerable: If selected the time is reset each time the input status changes.

English

PASSING MAKE CONTACT

In the PASSING MAKE CONTACT operator the output follows the signal on the input. However, if this is 1 (TRUE) for longer than the set time, the output changes to 0 (FALSE).

Parameters

Time: The delay can be set to between **10 ms and 1093.3 s**.

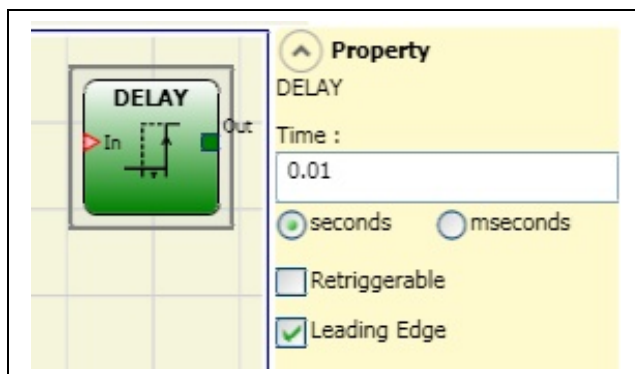*Retriggerable*: If selected the time is reset each time the input status changes.
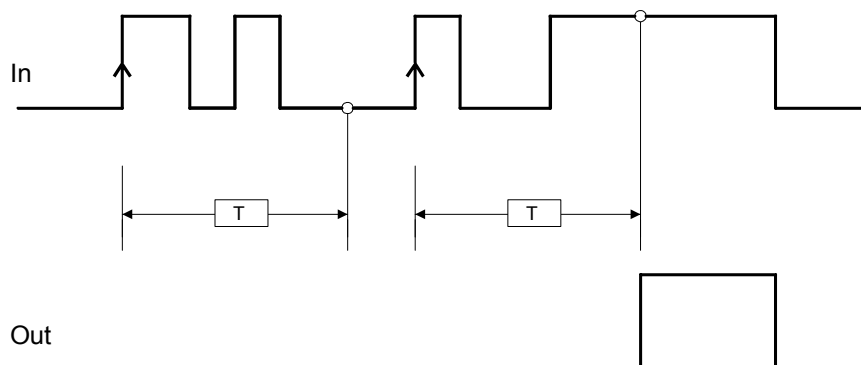
DELAY

The DELAY operator applies a delay to a signal by setting the output to 1 (TRUE) after the set time, against a change in the level of the input signal.

Parameters

Time: The delay can be set to between **10 ms and 1093.3 s.**

Rising edge: If selected, the delay starts on the input signal's rising edge at the end of which the output changes to 1 (TRUE) if the input is 1 (TRUE) where it remains for as long as the input stays at 1 (TRUE).

If not selected the logic is inverted, the output is set to 1 (TRUE) on the input signal's rising edge, the delay starts on the input signal's falling edge, at the end of the set time the output changes to 0 (FALSE) if the input is 0 (FALSE) otherwise it remains 1 TRUE.
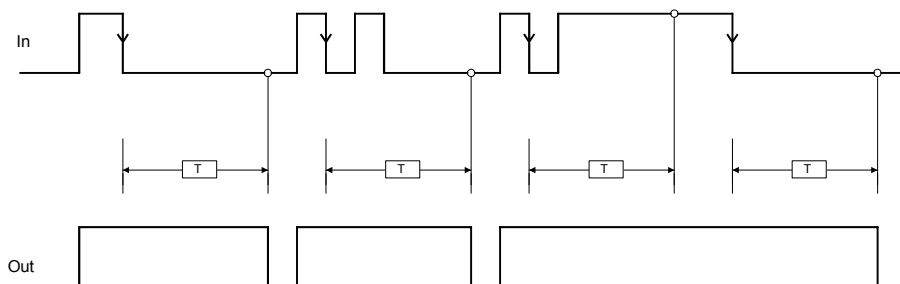
Retriggerable: If selected the time is reset each time the input status changes.

English

ACCESSORIES AND SPARE PARTS

MODEL	DESCRIPTION	CODE
M1	MOSAIC main unit (8 inputs / 2 double OSSD)	1100000
MI8O2	MOSAIC I/O expansion unit (8 inputs / 2 double OSSD)	1100010
MI8	MOSAIC input expansion unit (8 inputs)	1100020
MI16	MOSAIC input expansion unit (16 inputs)	1100021
MO2	MOSAIC output expansion unit (2 double OSSD)	1100030
MO4	MOSAIC output expansion unit (4 double OSSD)	1100031
MR2	MOSAIC safety relay unit (2 relays)	1100040
MR4	MOSAIC safety relay unit (4 relays)	1100041
MBP	MOSAIC PROFIBUS DP interface unit	1100050
MBD	MOSAIC DeviceNet interface unit	1100051
MBC	MOSAIC CANopen interface unit	1100052
MCM	MOSAIC external configuration memory	1100060
MSC	MOSAIC connector for 5-way communication	1100061
CSU	MOSAIC USB cable for connection to PC	1100062

English

WARRANTY

ReeR warrants that all of its MOSAIC units shall be free from defects in material or workmanship for a period of 12 (twelve) months from the date of shipment. This warranty applies to the products under normal conditions of use.
If the product proves to be defective during the warranty period, ReeR will repair or replace any faulty parts without any charge for material or labour.
ReeR S.p.A. may, at its discretion, replace the defective equipment with the same type of equipment or with equipment having the same characteristics, rather than repair it.

This warranty is subject to the conditions listed below:
The customer must inform ReeR of the fault within twelve months from the date of delivery of the product.
The equipment and all components must be in the condition as they were at the time of delivery by REER.
The fault or defect must not been caused either directly or indirectly by:

- Improper use;

- Failure to comply with the instructions for use;

- Carelessness, misuse, incorrect maintenance;

- Repairs, modifications, adaptations not performed by REER, tampering, etc.;

- Accidents or collisions (also during transportation and as a result of force majeure);

- Other causes for which ReeR cannot be held liable.

The defective equipment must be delivered or shipped to REER's works to be repaired: the warranty does not cover costs of transport or the risk of damage to or loss of the equipment during shipment, which shall be borne by the customer.
All products and components that are replaced become the property of REER.
ReeR shall not be held liable under any other warranties or rights except for those expressly indicated above. ReeR shall not therefore accept claims to pay damages for expenses, interruption of work or other factors or circumstances in any way related to failure of the product or any parts thereof.

Please, visit the website www.reer.it for the list of the authorised representative of each Country.

Precise, complete compliance with all standards, instructions and warnings in this handbook is essential for the correct operation of the device. ReeR therefore declines any responsibility for all and anything resulting from failure to comply with all or some of the aforesaid instructions.

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English

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